BIOLOG

MicroStation™ System
MicroLog
Version 4.2

User Guide

Trademarks

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MicroStation System, MicroLog Version 4.2 User Guide

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Table of Contents

1. Welcome

In this section:
➔System Requirements
➔Installing MicroStation/ MicroLog Software and Biolog Databases
➔MicroStation/ MicroLog Software Configurations

Welcome to Biolog's MicroStation™ System. The MicroStation System includes everything you need to use all the features of MicroStation software. If you ordered a MicroStation System with a computer, it should include the following:

- Multimedia-compatible computer with color monitor
- Windows® operating system installed
- MicroStation Reader
- Turbidimeter
- MicroStation/MicroLog software on CD ROM
- Multichannel repeating pipettor

Note: MicroLog 1 and MicroLog 2 systems do not include the MicroStation Reader or pipettor.

System Requirements

If you are installing MicroStation/MicroLog software on a computer system you already have, you will need the following minimum requirements:

- Pentium® PC with 512 Cache, 700 mHz or comparable
- 256 MB RAM
- 80 GB Hard Disk Space
- CD ROM drive
- Microsoft two-button mouse
- Monitor: 800x600 pixel resolution; 6 bit, 256 color
- Windows XP® , Service Pack 2

Note: The software is not designed to run on a Macintosh®.

NOTE:
Throughout this guide, references are made to other sections in the following manner:

•Section 5 page 3, referring to the third page of the fifth section.

Or,

•Page 3.5 referring to the fifth page of the third section.

Connecting the MicroStation System

1. Unpack all materials. Your MicroStation arrives in many boxes. Check that all items have arrived against the packing slip.
2. Connect the computer, monitor, keyboard, and mouse.
3. Connect the reader, per enclosed instructions.
4. Set up the turbidimeter, per enclosed instructions.
5. Plug in the pipetter to fully charge the battery.

MicroStation/MicroLog Software Configurations

In order to make the power of the MicroStation System available to a variety of microbiology laboratories with different needs and budgets, Biolog sells three configurations of MicroStation/MicroLog software.

This user guide contains instructions and information for all basic and advanced features of MicroStation/MicroLog software. Depending on the software configuration you purchased, some sections of the manual may not apply to your lab.

Table 1.1 shows the differences between configurations.

Software Configuration	Specifications
MicroLog 1	➔ Identification only ➔ Visual reading only (no MicroStation Reader)
MicroLog 2	➔ All advanced features, Restricted or Unrestricted Mode ➔ Visual and file reading only (no MicroStation Reader)
MicroStation/ MicroLog 3	➔ All advanced features, Restricted or Unrestricted Mode ➔ MicroStation Reader (visual and file reading also possible)

TABLE 1.1. MICROSTATION/MICROLOG SOFTWARE CONFIGURATIONS

If you bought MicroLog1

➔ Skip material dealing with the MicroStation Reader, Worksheets, Adjusting Thresholds, and Data Management, Compiling Databases and Restricted Access.

If you bought MicroLog2

➔ Skip material dealing with MicroStation Reader.

If you bought MicroStation/ MicroLog 3

➔ Read the entire User Guide.

MicroStation/MicroLog User Guide Access

In order to access the MicroStation/ MicroLog 4.2 User Guide, Acrobat Reader must be installed in your computer. If you do not have Acrobat Reader already installed in your computer, then a set-up program called "Acrobat Reader 7.0.exe exists in the Manual sub-directory under …**Program Files\Biolog\MLN_XX_XX (e.g. ML3 version 4.20.05 is 42_05)**. Run the set-up application and follow its instructions.

21 CFR Part 11 Compliance

The MicroStation/MicroLog system is designed to exist within a 21 CFR Part 11 environment. We provide the basic functionality to support our customer's compliance efforts.

The objective of the original regulation is to ensure integrity of electronic records by:

1. Limiting Access
2. Ensuring that original record files can not be modified.
3. Providing documentation of what was changed, by whom and when.

Within "Restricted Access Mode" the software will enforce all of the security Microbial identification tasks accomplished in accordance with the guidelines of 21 CFR Part 11, ensuring data integrity and security controls. Database management (audit control) will need user procedural controls to manually freeze files after edits are made

The software is both password protected and encrypted.

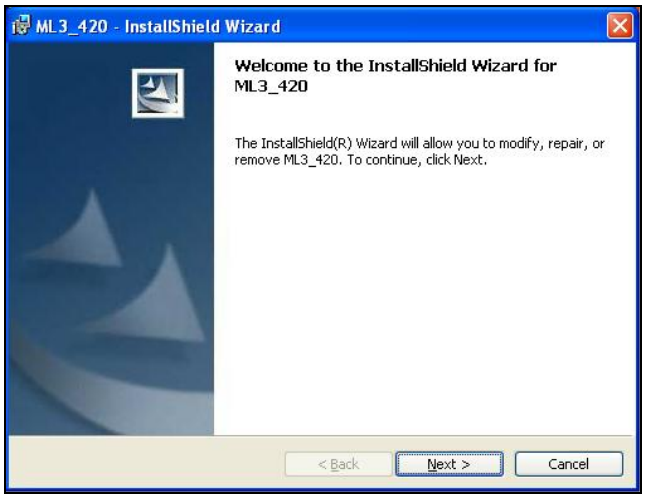
The MicroStation/MicroLog Software combined with the RetroSpect™ Trending and Tracking Software meets the needs of facilities that must adhere to strict regulatory guidelines.

2. Installation and Registration

In this section:
➔System Requirements
➔Installing MicroStation/ MicroLog Software and Biolog Databases
➔MicroStation/ MicroLog Software Configurations

Installing the MicroStation/MicroLog Software

1. Insert the software CD into the CD ROM drive.
2. The software setup Installer will initialize. This will take a few moments to prepare.
3. The software – **InstallShield® Wizard** will appear. Click **Next**.



4. The **License Agreement** will appear. Review the terms and select the **I accept the terms in the license agreement** radio button. Click **Next**.
5. The next screen that appears gives you the option of where to install the software root directory folders:

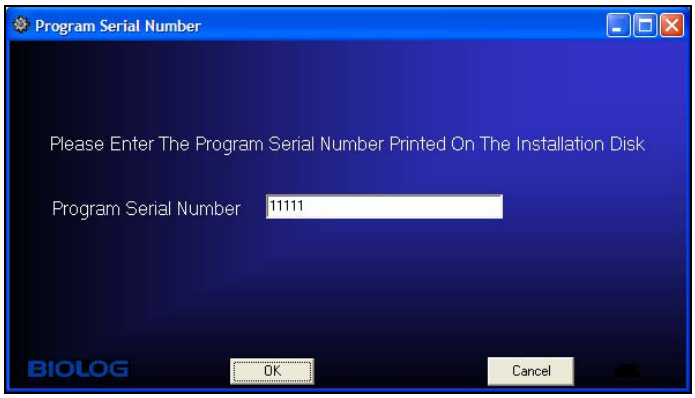
   Destination Folder - The root directory (for the software) may be installed anywhere on a stand alone PC or on a network drive. If you do install the directory on a network drive, please remember that this program is currently not designed for multiple users at one time.

   - The default/suggested installation location is …**\Program Files\Biolog\MLN_XX_XX (e.g. ML3 version 4.20.05 is 42_05).** Click **Next** to accept this default location.
   - To choose your own location, click **Change**. Select the **Look In** pull down menu to browse for a location. Select the location and click **OK**.

Important!

- **The person installing the software must be logged in through the Windows operating system as the Administrator.**

6. Now the **InstallShield Wizard** is ready to begin installation. Choose **Back** to make any changes, **Cancel** to exit the InstallShield Wizard and not install the program, or **Install** to proceed with installation.
7. The next screen that appears asks you to enter the serial number of your program (found on the spine of the software jewel case). Enter the **Serial Number** and click **OK.**



Note:
The Readme Information is not printable at the InstallShield Wizard window. The file is located in the MicroStation\ MicroLog Software root directory and is named *readme.rtf*. Go to this location to open and print the Readme information.

8. The **Installing Software** screen will appear while the installation is taking place. Click **Finish** when the InstallShield Wizard Completed screen appears.

The following shortcut icons will now be installed on your desktop:

- **MLN_XX_XX.exe** is for the program
- **MicroLog ID User Guide**

Please remember that the program will be accessible for up to 30 days. After 30 days the software must be registered to use!

First Log-In and Setting up an Administrator

The program is ready to be opened for the first time. The program operates in the Restricted Access Mode.

Restricted Access Mode requires that only the **Program Administrator** oversees and controls who has access to the program. The person who is designated as the Original Program Administrator should perform the first Log-in. This individual then manages who has access to the application and what tasks they can perform. If desired, more that one user can be assigned Administrator Privileges on the User List.

The Administrator will:

- Assign User names and passwords for those who will use the system.
- Assign access privileges to each user.

The following steps must be implemented by the user who will act as the program Administrator.

1. Click on the '**MicroStation/MicroLog'** shortcut icon on your desktop.
2. The **Welcome** screen will appear. Click the **Administrator Login** key in the lower right hand corner.

3. The **Administrator Dialog** box will open.
   - Enter a Username that is at least 1 character in length.
   - Enter a Password that is at least 6 characters in length and contains at least one number. *The password is case sensitive*.
4. Click **OK**.
5. When the message "*Click on the Log In button at the top right to log in to the program*" appears, click **OK**.
6. Click on the **Log In** box located in the upper right hand corner of the **Welcome** window. A **Password Dialog** box will appear.

Note:
Not all users will have full administrative privileges. To learn more about assigning user names and passwords, as well as setting up different levels of user access, please refer to *Section 9.*

7. Enter the Administrator username and password you set in **Step 3**. Click **OK**.
8. You will now be logged in with full user privileges.

Registering your Software

After initial installation, the **Welcome** tab will show **"Temporary Registration Days Left: 3"** in red. The software will count down how many days you have left to register. You must click the **Registration button** to start the registration process.

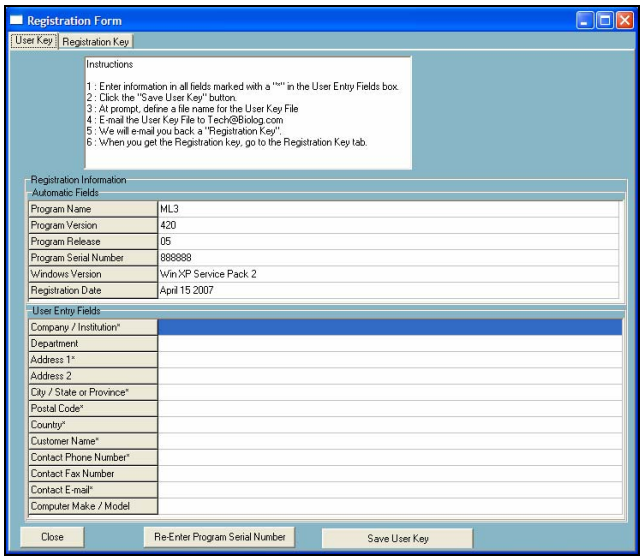
Note:
There is only 1 registration button access per session. Log-Out and Log-In for additional access.

Registration Process

1. Generate a **User Key** and send to Biolog
2. Load the **Registration Key** from Biolog

Follow the steps outlined below to generate a User Key:

1. At the **Welcome** tab, click on the **Registration** button.
2. The **Registration Form** window appears.



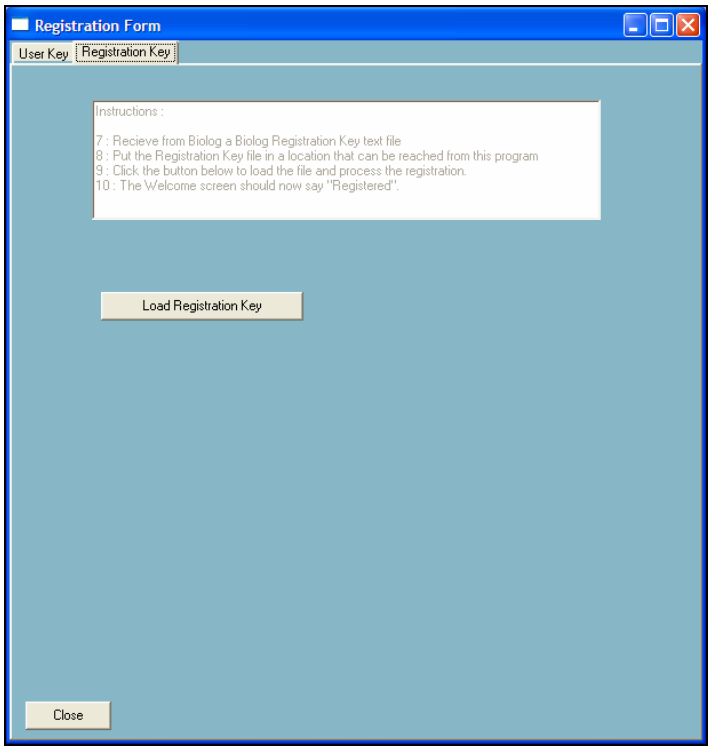
- **Each computer requires a separate registration key.**
- **Your registration key should arrive within 48 business hours, providing it is received Monday to Thursday during regular Biolog business hours (M-F 8:30 A.M. – 5:00 P.M. PST).**

3. Fill out <u>every line</u> of the **Registration Form**. (* Required Fields)
4. Click the **Save User Key** button.
5. A **Save As** window appears. Type a file name for the User Key File in the **File Name** field. The **Save as Type** field should show Text Files as the default file type.
6. Click **Save**. The User Key will be saved as a text file.
7. Click Close.

8. E-mail the User Key File to tech@biolog.com.

Follow the steps outlined below to load the Registration Key:

1. Biolog will e-mail you a Registration Key. Save the attached registration key file on your hard drive **(…\ML*N_XX_XX*\Certificates)**.
2. Once you have saved your Registration key, open the MicroStation/MicroLog Software program, and click on the **Registration** button to open the **Registration Form**.
3. Click on the **Registration Key** tab that is on the registration form. Then click the **Load Registration Key** button to load the registration key file and process the registration.



4. The Temporary Registration box on the Welcome screen should now read "**Registered**", and turn from red to gray.
5. The Registration Button is no longer present.

Installing Biolog Databases

Installing a MicroLog database

Install databases in any order. There are six available databases each on a separate CD.

- Gram Negative (GN)
- Gram Positive (GP)
- Anaerobe (AN)
- Yeast (YT)
- Filamentous Fungi (FF))
- Dangerous Pathogens (DP)

Note: Yeast or Filamentous Fungi databases requires use of a MicroStation Reader.

1. Check to make sure you have the MicroLog database CD ROM.
2. Put the database CD ROM into the CD ROM drive.
3. Click **Start**.
4. Select **Run**. Click on Browse. Click on the CD ROM drive.
5. The field should read **D:\SetUp(**database**).exe**. If drive D is not your CD ROM drive, then type in the correct drive letter.
6. Click **OK**.
7. Follow the instructions on the pop-up dialogs. Make note of the drive and directory path into which the database is installed.
8. To install the database into the default directory (…**Program Files\Biolog\MLN_XX_XX)**, click **Finish**. If you chose a different directory for the ML software, then type in the name of that same directory, before clicking **Finish.**

Running MicroLog software

Double-click the MicroLog desktop icon.

3. MicroStation System/MicroLog Overview

In this section:
- **How It Works**
- **The Identification Process**
- **Easy-to-Use Software**
- **The Math Behind the Software**
- **Identifying Microbes and Managing Data**

The MicroStation System/MicroLog is an easy-to-use yet advanced tool for identifying and characterizing microorganisms. Our combined databases include over 1,900 species of aerobic bacteria, anaerobic bacteria, fungi and yeasts. They contain nearly all of the significant species encountered in diverse practices of microbiology, including pharmaceutical, biotechnology, cosmetic, and medical device companies; veterinary medicine; agriculture and environmental science; food processing, spoilage, and safety; reference laboratories; industrial microbiology; and research and education.

MicroStation/MicroLog continues to expand and evolve to keep pace with progress in the field of microbiology. Every month researchers discover new species of microorganisms and recognize their importance. Biolog's patented microbial identification technology with 95 carbon source utilization tests in a microtiter plate format (MicroPlate™) can recognize over 4×10^{28} possible metabolic patterns. This provides room for future growth of the system, so that the technology will remain state-of-the-art.

How It Works

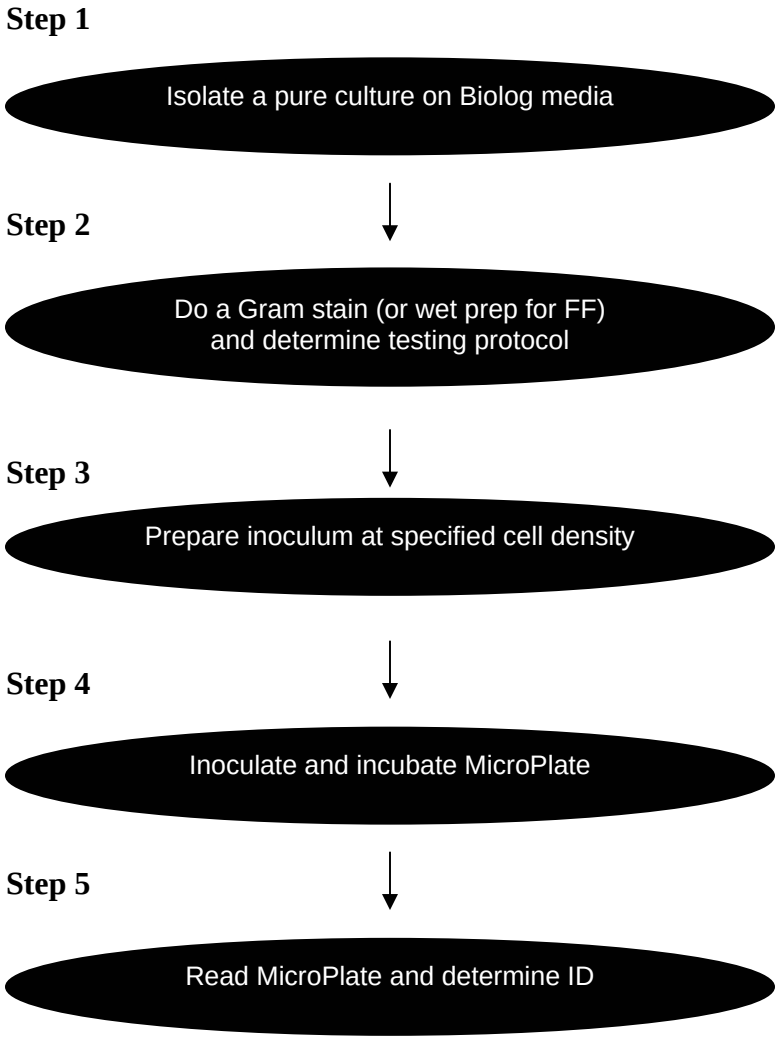
Biolog's innovative, patented technology uses each microbe's ability to use particular carbon sources to produce a unique pattern or "fingerprint" for that microbe. As a microorganism begins to use the carbon sources in certain wells of the MicroPlate, it respires. For bacteria, this respiration process reduces a tetrazolium redox dye and those wells change color to purple. The end result is a pattern of colored wells on the MicroPlate that is characteristic of that microorganism. For fungi, respiration and assimilation are detected. The color change in the wells is reddish orange due to the respiration of fungi, which reduces the dye. Assimilation or growth is detected by the turbidity of the well.

A bacterial pattern is readable either visually or by a fiber optic reading instrument – the MicroStation Reader. This reader is required to read a yeast or fungal pattern. The fingerprint data is fed into the software, which searches its extensive database and makes a identification in seconds. By developing a simple tool that allows 95 simultaneous carbon source utilization tests, Biolog has accomplished its goal of producing an efficient, easy-to-use, powerful, and reliable microbe identification system.

The Identification Process

Microbial identification involves five basic steps. These steps apply to all identifications. A small number of species have peculiarities that may require an extra step or special handling techniques.

The Microbial Identification Process



Step 1: Isolate a pure culture on Biolog media

Isolating a pure culture is not always easy. For example: Bacteria often have sticky surfaces and cells sometimes stick together in clumps. As a first step to accurate microbe identification, streak agar plates using correct techniques to generate well isolated colonies. Always use Biolog-recommended culture media and growth conditions. See Section ***4*** for full culturing and incubation instructions.

Step 2: Do a Gram stain and determine testing protocol

Follow directions closely to obtain accurate results.

For bacteria, proper Gram stain technique and interpretation are the important second step in the ID process. See pages 4.2 and 10.1-10.2. For FF identification, use the wet prep test as necessary to differentiate yeasts from filamentous fungi.

Step 3: Prepare inoculum at specified cell density

Microbiologists are sometimes trained to prepare cell suspensions by judging cell density by eye. This practice will not yield accurate and reproducible results. Cell density determines oxygen concentration – a key parameter to control when testing microorganisms in MicroPlates. In addition, Biolog has carefully optimized the required inoculating fluids. Don't deviate from Biolog's inocula preparation directions See pages 4.7 - 4.10.

Step 4: Inoculate and incubate MicroPlate

Pipet the specified amount of cell suspension into the MicroPlate, put the lid on, and incubate under the same conditions of temperature and atmosphere used to culture the microorganism. Biolog MicroPlates do not need oil overlays or color-developing chemicals.

Step 5: Read MicroPlate and determine ID

After an appropriate incubation time, read MicroPlates either by eye or using the MicroStation Reader. In either case, the pattern formed in the wells is entered into the software, which searches the database and provides an identification in seconds.

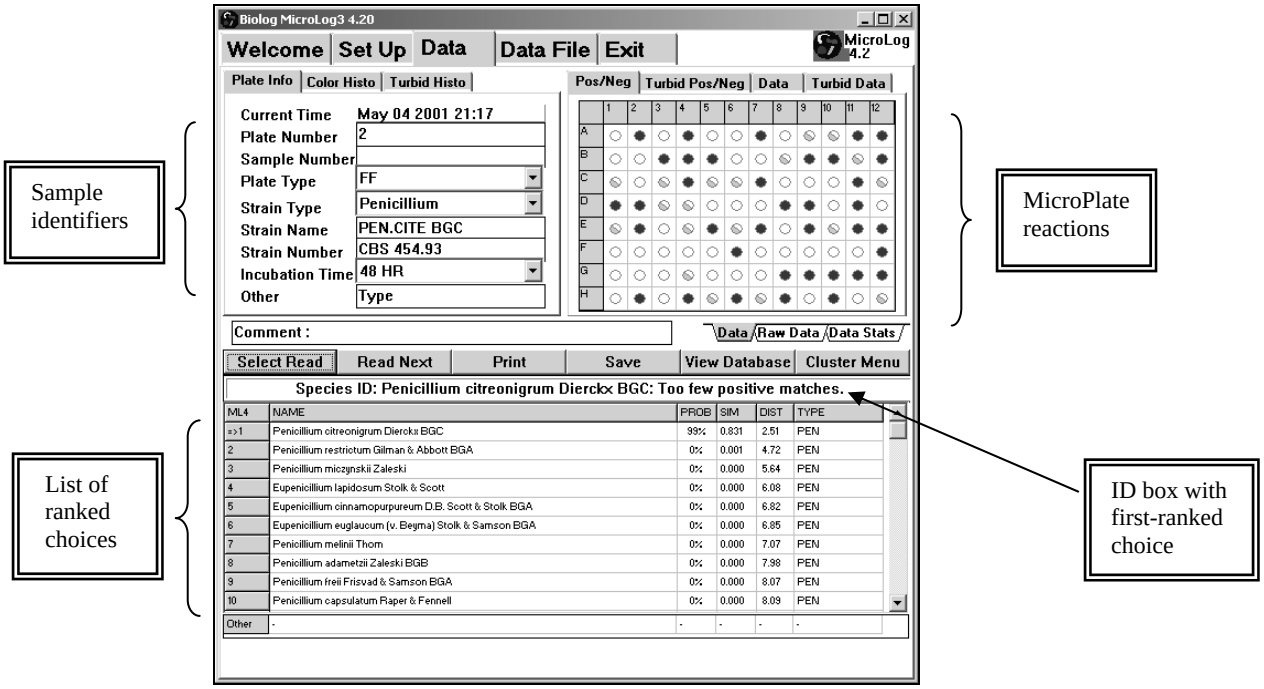
Easy-to-Use Software

MicroStation/MicroLog provides an easy-to-follow visual software interface to lead you through the identification process. The software can

be run in a restricted access mode that provides lists of user names, passwords, and a hierarchy of log-in privileges. This ensures the integrity of electronic records by limiting access, providing documentation of changes made, creating audit trails, allowing you to freeze data, and ensuring that original file records have not been modified or deleted.

You'll spend most of your time using the Data window, with its areas for entering sample identifiers (strain name, strain number, etc.), viewing and entering MicroPlate reactions (positive, negative, and borderline), and viewing microbial identifications.

Once you're familiar with the system, you'll be able to prepare your samples using proper techniques, read MicroPlates either singly or in batches, prepare worksheets to save time, build your own database, and analyze data using the advanced functions built into the software.



DATA WINDOW, WITH RESULTS

Logging In and Out

First, follow these steps to Log In and Out of the program, as well as switch users. Remember, every person who wants to use the program must always enter a User ID and password to access the program. This provides important security to the program by putting controls on and keeping a record of who accesses the program.

Logging In

1. Click on the **'MicroStation/MicroLog'** shortcut icon on your desktop
2. The **Welcome** screen will appear, along with a **Password Dialog** box.

3. Enter your Username and Password. Click **OK**.
4. You will now be Logged In, and the Welcome interface will appear.

Timed Log Out

The software program has a default setting to automatically **Log Out** if the program has not been used for 15 minutes. The **Login Time Out** screen will appear. Simply select the **Click Here** button to stop the Log Out process and continue using the program. Otherwise the program will log off, return to the **Welcome** window, and display a new **Log In** dialog box.

Logging Out and Switching Users

There are 3 ways to end your use of the program:

1. Select the **Exit Tab** and then click the **Exit** button.
2. Click on the **Change Users** button in the center of the **Welcome** window. The **Password Dialog** box will be displayed for the new user to enter their username and password.
3. Click on the windows page "**X"** button.

The Math Behind the Software

MicroStation/MicroLog software uses extensive computer algorithms to take the information from the observed pattern and compare it to the database.

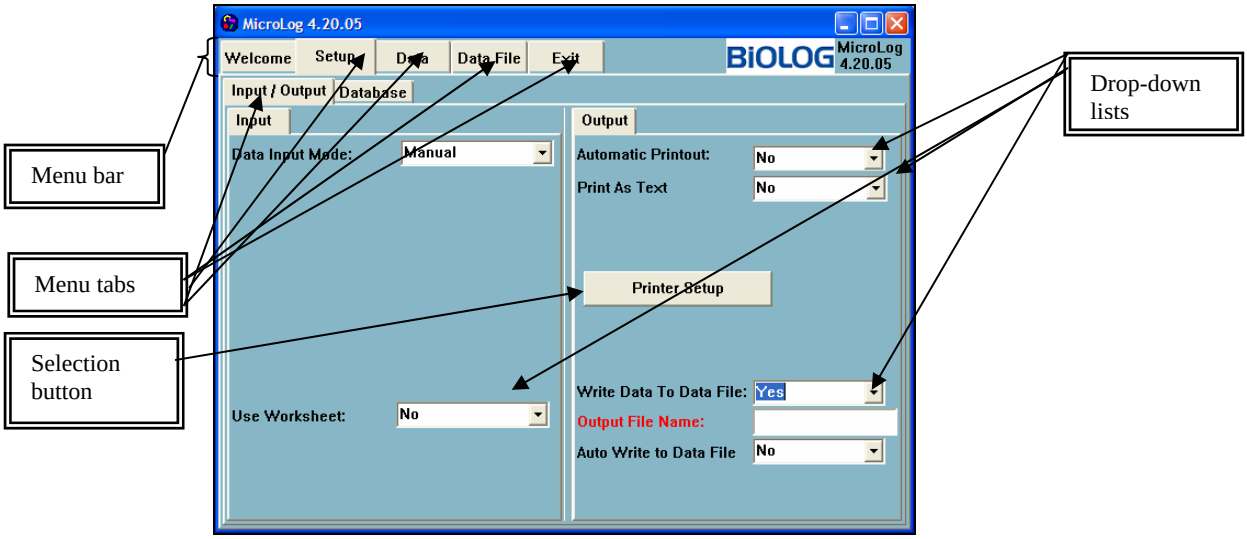
In simple terms, the software rapidly compares the positive-negative-borderline color pattern in the MicroPlate to the species pattern in the appropriate database. The patterns that most closely match your microbe's pattern are shown on the screen in ranked order. Before making a decision on the result, the software considers the possibility that even the first-ranked choice may not be a good match. It looks to see whether the first choice match is really "close enough" to be acceptable. If not, a "No ID" designation will result.

For GN, GP, and AN databases, MicroStation/MicroLog uses a newly developed pattern matching method called Progressive ID (PID). This method more accurately identifies species patterns by considering the progressive sequence in which purple wells are formed. Typically, microorganisms will use their favorite carbon sources most rapidly and completely, resulting in dark purple wells that form quickly. Less-preferred carbon sources are consumed slowly or incompletely, resulting in slower-forming or lighter purple color. The extra information considered by the PID matching method brings a higher level of consistency and accuracy, representing another innovation in Biolog's technology.

For YT and FF databases, MicroStation/MicroLog uses the developed pattern matching method called Endpoint ID (EID). This method more accurately identifies species patterns by considering the daily endpoint determinations. For the YT MicroPlate, turbidity may be caused by either growth or color formation. For the FF MicroPlate, both growth (measured by turbidity) and color formation are measured independently for each well.

Identifying Microbes and Managing Data

The software is structured to move you easily through identifying microbes and managing data. Navigation tools include a menu bar at the top of the window, menu tabs to move from window to window, drop-down lists to choose from pre-set choices, selection bars to reach detailed setup windows, and fields to type in specific data.

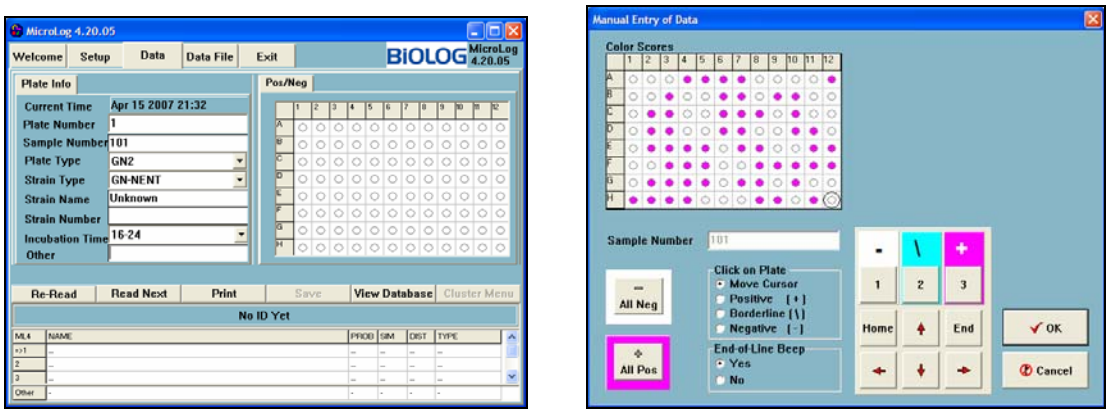


SET UP WINDOW (SHOWING NAVIGATION TOOLS)

The software will guide you in answering the following questions:

- Do I plan to read MicroPlates visually?
- Will I use the reader or will I read back from a file?
- Do I want an automatic printout of results?
- Do I want to select a specific printer?

If you plan to enter MicroPlate reactions manually you'll enter sample identifiers using the mouse, keyboard, or on-screen methods to indicate positive, negative, or borderline MicroPlate reactions.



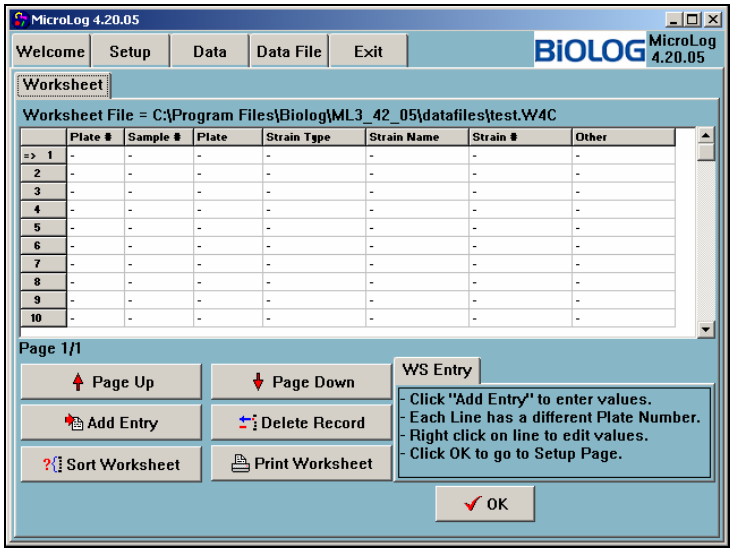
ENTERING SAMPLE IDENTIFIERS AND MICROPLATE REACTIONS

In addition, the software allows you to:

- Use worksheets
- Save data
- Edit files and build databases
- Adjust thresholds
- View a database
- Perform cluster analysis

Using worksheets

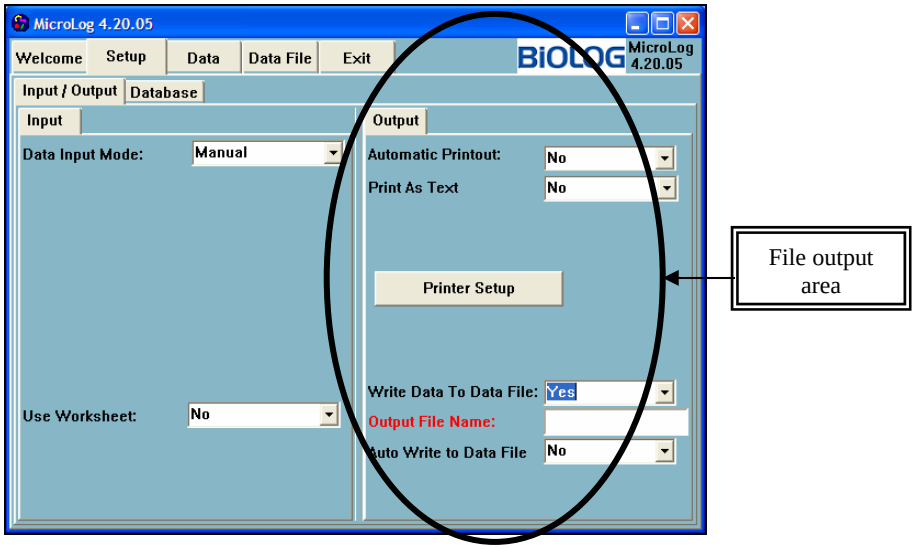
Worksheets allow you to enter all of your sample identifiers ahead of time. This speeds the reading process and enables you to read high MicroPlate volumes more efficiently.



WORKSHEET (WITH SAMPLE ENTRIES) FOR BATCHING MICROPLATES

Saving data

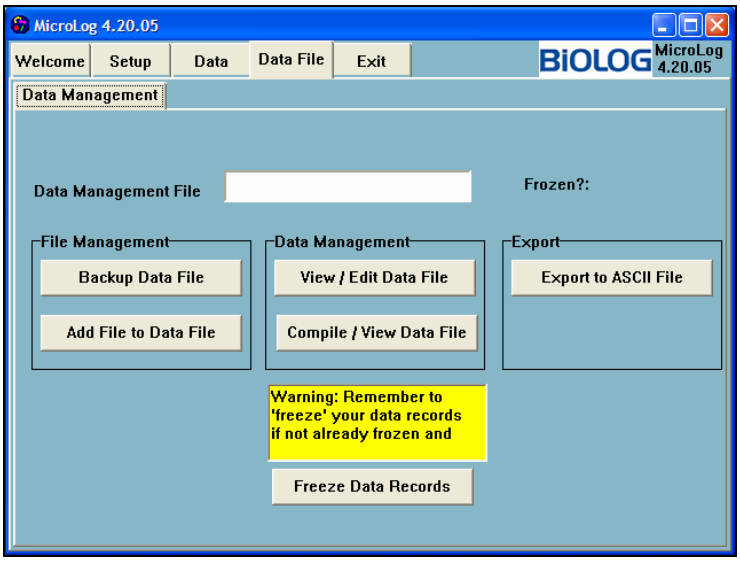
You can save your results into files and manage them by using the Output options on the **Set Up** window.



FIELDS FOR NAMING AND SAVING FILES

Editing files and building databases

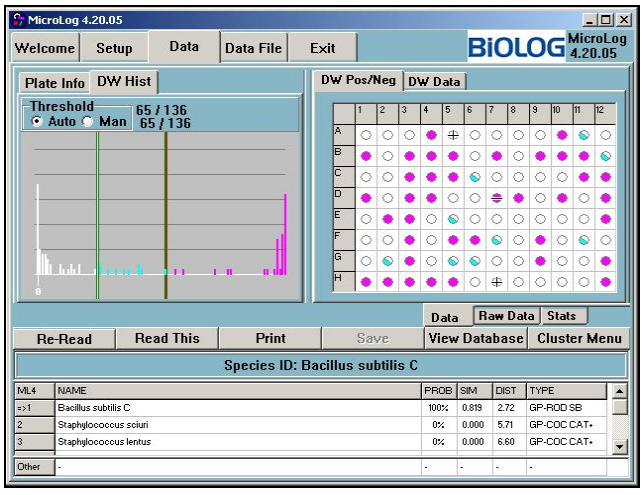
You can also select which database you want to use – Biolog's or your own. Advanced Data Management functions allow you to view data by strain or plate type, edit data files, build your database, and perform a number of other database management techniques.



DATABASE MANAGEMENT WINDOW (FOR ADVANCED DATABASE FUNCTIONS)

Adjusting thresholds

Another software advanced feature for bacteria is the capability of adjusting thresholds by using histograms. This function may be appropriate if you feel that the automatic reading of your MicroPlate does not match your visual interpretation.

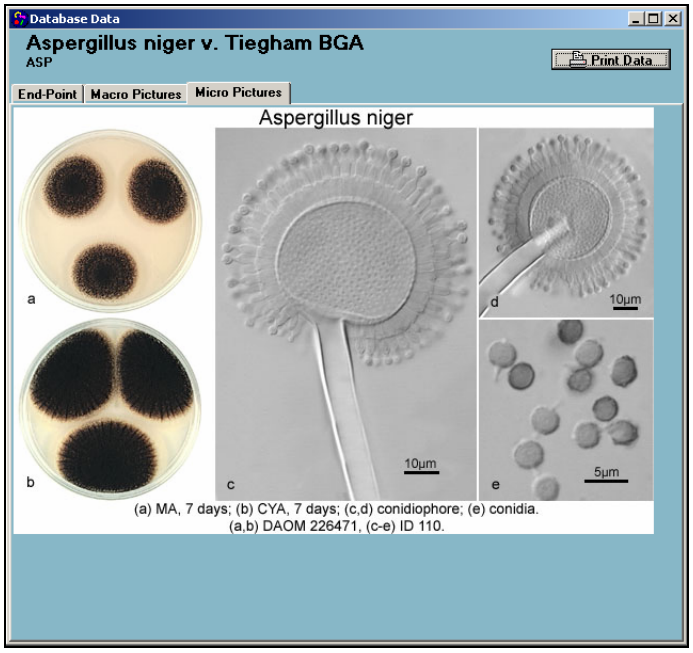


HISTOGRAM AND MICROPLATE DATA (FOR MANUAL ADJUSTMENT OF THRESHOLDS)

Viewing databases

The **View Database** function allows you to access end-point and/or progressive data of specific organisms in each of Biolog's databases.

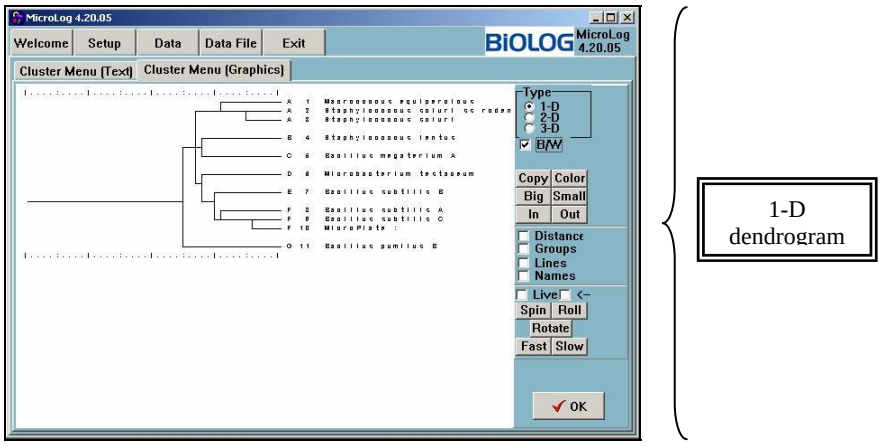
The function also allows you to view the Macroscopic and Microscopic image libraries included in the Filamentous Fungi (FF) Database.

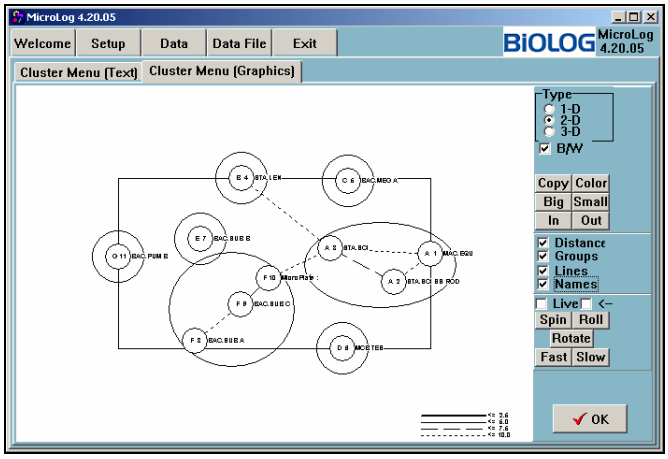


EXAMPLE OF MICRO PICTURES FROM THE FF DATABASE IMAGE LIBRARY

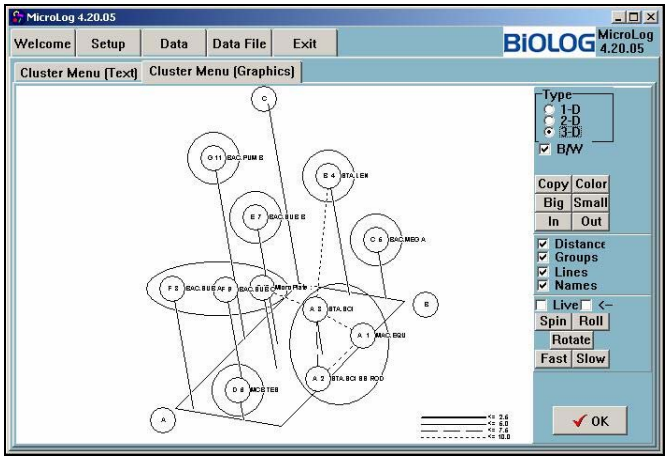
Performing cluster analysis

Cluster analysis is an advanced feature that offers visual ways to simplify interpretation of data sets. You'll be able to view dendrograms, two-dimensional, and three-dimensional cluster diagrams.





2-D dendrogram



3-D dendrogram

4. Preparing Samples

In this section:

As with any system, the precision and accuracy of MicroStation/ MicroLog results require proper sample preparation. The most common identification problems result from improper lab technique and using non-recommended media. Using good sterile technique and the correct media greatly increase the likelihood of problem-free microbe identification.

If you're thinking of using non-recommended media – *don't*. The extensive MicroLog databases were specifically developed using Biolog's carefully selected media. Using non-specified media causes changes in the physiology of microbes. Luxuriant growth and full metabolic activity are required for the system to work well.

The flowchart on page 2.2 provides an outline of the identification process. The tables on page 4.16-17 give a comprehensive overview of the sample preparation process, as does the flowchart in the Appendices. See pages 9.2-9.6 for detailed media preparation instructions. Refer to Appendix 6 when using the DP (Dangerous Pathogen) database.

For additional information refer to Instructions for Use specific to the plate type (supplied with each purchase of MicroPlates).

Isolating a Pure Culture

Culture your sample on Biolog's general-purpose culture medium. Nearly all the bacterial species in the MicroLog databases will grow on Biolog Universal Growth media (BUG or BUA), generally with the addition of either 5% sheep blood or maltose. Prepare media according to package insert. Yeast are cultured on BUY (YT), while filamentous fungi (FF) are cultured on 2% Malt Extract Agar. .

Biolog special agar:
BUG = Biolog Universal Growth
BUA = Biolog Universal Anaerobe
BUY = Biolog Universal Yeast
2% ME = 2% Malt Extract Agar

Each shipment of Biolog MicroPlates comes with instructions. Refer to these for detailed directions about how to grow a healthy culture. In general:

- Make certain you have a pure culture (a single strain).
- Incubate at optimal temperature. Most bacteria should be grown at 35-37° C or 30° C depending on genera. (A few gram positive, anaerobic organisms, yeasts and filamentous fungi are grown at 26° C.)

Preparing an inoculum directly from a mixed-growth plate will cause identification problems. Use the colony magnifier lamp to closely examine colonies.

- Do not allow cultures to grow for too long. Maximum growth is 24 hours for most bacteria, 72 hours for yeasts, and 10 days for most fungi. Some exceptionally slow-growing or fastidious bacteria may require 48 hours of growth or the use of multiple growth plates.

Checking to see if your culture is pure

Colonies on the plate that seem to be isolated, may in fact be the result of mixed growth. This is especially true with *Staphylococcus* species. Careful visual examination is essential to ensuring that a culture is pure. It may be useful to use a colony magnifier lamp to assist in the examination. If a colony shows any hint of pleomorphism, it is probably not a pure culture and requires additional re-streaking and isolation.

Carefully examine areas of confluent growth. If the lawn is not uniform in texture and color, this may indicate that the culture is not pure. Once again, restreak for isolation.

Note: Unless your organism is a very slow grower, we don't recommend using lawn growth.

The opposite problem can also occur; sometimes a culture may be pure, but give the appearance of heterogeneity. This is due to a rather common phenomenon whereby microorganisms produce more than one colony type. To be certain of its identity, purify and test each colony type individually. Be aware that different colony types of the same strain may ID but give different phenotype profiles.

Gram Staining

A Gram stain is essential in order to select the proper media and MicroPlates for testing bacteria. Once your initial culture has been incubated sufficiently, perform a standard Gram stain. Determine the following:

- Is the microbe a bacterium or a yeast?
- Is the microbe gram positive or negative?
- Are the cells cocci or rods?
- Do the cells form spores?

Based on the source of the sample, the initial growth conditions, and the Gram stain, you should know what basic type of microbe you have. See pages 10.1-10.2 for specific Gram stain information. Refer to a basic microbiology textbook if you are unsure of these procedures.

Wet Prep

A wet prep is performed to determine if the microbe is a yeast or filamentous fungi. This is an optional test, required only if the form is uncertain. Refer to a basic microbiology textbook if you are unsure of this procedure.

Characterizing Aerobic Bacteria

Gram-negative and gram-positive aerobes require further investigation to determine proper handling and identification.

Attention!
Please refer to Appendix 6 when using the DP (Dangerous Pathogen) Database.

Characterizing gram-negative microbes

If your microbe is gram negative, several additional tests will help determine whether your microbe is non-enteric **(GN-NENT)**, enteric **(GN-ENT)** or fastidious **(GN-FAS)** as well as determine the proper setup protocol. This has important implications in regards to choice of incubation temperature, inoculum density, and inoculating fluid.

Enteric: gram-negative bacteria belonging to Enterobacteriaceae group

Non-enteric: gram-negative bacteria not belonging to Enterobacteriaceae group

Performing an oxidase test

- Do an oxidase test on all gram-negative organisms. Refer to a basic microbiology textbook if you are unsure of this procedure.
- If the oxidase test is positive, you have a non-enteric (GN-NENT) microbe.
- If the oxidase test is negative you most likely have an enteric (GN-ENT) microbe.
- If you are uncertain about whether the microbe is enteric or non-enteric, set up a TSI slant.

Setting up a TSI slant

- Prepare a TSI slant on oxidase-negative microbes. Refer to a basic microbiology textbook if you are unsure of this procedure.
- If the TSI slant shows a K/K (alkaline/alkaline) or K/A^{w} (alkaline/weak acid) reaction, your microbe is non-enteric (GN-NENT).
- If the TSI slant shows an A/A (acid/acid) or K/A (alkaline/acid) reaction, your microbe is enteric (GN-ENT). This is true with a few exceptions (such as *Pasteurella species=A/A, or Acinetobacter A/late A*), which can be weak oxidase positive.

Recognizing fastidious gram negatives

- Fastidious gram-negative bacteria are primarily isolated from the respiratory tracts of mammals.
- These bacteria grow poorly or not at all on BUG + B medium. Some *Moraxella species* do grow well on BUG + B, but should be set up as fastidious gram negatives. They generally stain as gram-negative diplococci.
- They grow much better on chocolate agar at 35-37° C in an atmosphere of 6.5% CO_2.

Characterizing gram-positive microbes

If your microbe is gram positive, pay special attention to the cell morphology in the Gram stain. Note the following:

- Determine whether the microbe is a coccus or a rod.
- If you are unsure if your organism is a coccus or a rod (e.g., cocco-bacillus), set up a MicroPlate and select the **GP-COCCUS-ROD** strain type option to determine the correct identification.
- If the microbe is a rod (GP-ROD), determine whether it is spore-forming bacillus (GP-ROD SB, consisting of *Bacillus* and species formerly called *Bacillus*). Spore-formers require special handling and testing. See pages 4.10- 4.12.
- It can be difficult to recognize *Bacillus* species from a Gram stain, but most can be recognized by colony morphology. They are often fast growers, forming colonies that have unusual characteristic textures (e.g., slimy, crusty, dry, embedded, or forming skin-like pellicles). Prepare a wet mount to look for spores, retractile ovals or spheres.

Performing a catalase test

It is advisable to perform a catalase test (3% hydrogen peroxide) on GP-COCCUS and GP-ROD isolates. The catalase reaction can help you verify or narrow down the species identification. Refer to a basic microbiology textbook if you are unsure of this procedure.

If the organism is catalase-negative, this generally indicates a slow grower (CO_2 may be required). Use a swab or loop to subculture the organism onto the agar to obtain a lawn of growth. You may need more than one agar plate.

Do not perform a catalase test from a blood plate, it may give false positive results.

Characterizing Anaerobic Bacteria

Gram-negative anaerobic rods require further investigation to determine proper handling and identification.

Characterizing rapidly-growing, gram-negative microbes

If your microbe is rod-shaped, anaerobic, gram negative, and grows rapidly, a kanamycin disk test will help differentiate *Fusobacterium* from *Bacteroides/Prevotella*. This has important implications in regards to choosing the appropriate inoculation protocol.

Performing a kanamycin disk test

- Streak rapidly-growing, gram-negative rods on BUA plates.
- Add a 1 mg kanamycin disk to the first quadrant (immediately after streaking, before incubating the organism).
- Incubate the plate overnight.
- If the bacterium is sensitive (a 10 mm zone of clearing will surround the kanamycin disk), you have a presumptive *Fusobacterium*.
- If the bacterium is resistant (no or <10 mm zone of clearing around the kanamycin disk), you have a presumptive *Bacteroides* or *Prevotella*.
- This distinction is important when inoculating AN MicroPlates. See pages 4.15-4.16.

Characterizing Filamentous Fungi and Yeast

The Filamentous Fungi database is unlike any of Biolog's other databases. It consists of eight separate databases that are accessed by selecting the **Strain Type**. It is important to correctly determine the database you wish to search by entering the appropriate **Strain Type** on the worksheet or in the **Data** window for single FF MicroPlate reads.

- The Air database includes the most commonly isolated filamentous fungi and yeasts from the air.
- The Food database includes the most commonly isolated filamentous fungi and yeast from food.
- The Yeast database contains a limited number of yeasts.*
- The Aspergillus, Colletotrichum, Fusarium, Penicillium, and Trichoderma databases contain anamorphs and teleomorphs related to the specific genera.*

**Note: These databases are intended for use by researchers working on a specific genera, not for routine food and air isolates.*

Culturing Your Microbe

From a single isolated colony subculture your microbe onto the proper agar medium. Most of the species in Biolog's database are relatively fast growers. However, if your microbe grows slowly, you may need to streak (subculture) more than one agar plate.

Incubate according to instructions in package insert. In general:

- Incubate most organisms for 16-24 hours. Very slow-growing species and yeasts may require 48 hours. Slow-growing anaerobic bacteria may require even longer incubation. Incubate filamentous fungi for 5-10 days (sporulation of isolate). Slower growing filamentous fungi may require longer incubation for sporulation.
- Don't over-incubate your culture. Excess incubation can cause microbes to enter a stationary phase, during which they lose viability and metabolic activity.
- For best results, subculture anaerobic bacteria twice on BUA. Prepare the suspension from the second plate only.
- For filamentous fungi, subculture less hyphae for fast growing fungi and more hyphae for slow growing fungi.

Table 4-1 and Appendix ***2*** will help you select the correct culture medium.

Media shorthand:

B = blood
M = maltose
T = thioglycolate
ME = malt extract

Organism Type	Organism Abbreviations	Culture Media
Gram Negative Non-Enteric**	GN-NENT	BUG + B
Gram Negative Enteric	GN-ENT	BUG + B
Gram Negative Fastidious	GN-FAS	Chocolate
Gram Positive Cocci Gram Positive Rods (non-spore forming)	GP-COCCUS GP-ROD	BUG + B
Gram Positive Rods (spore forming bacillus)	GP-ROD SB	BUG + M + T
Anaerobes	AN	BUA + B
Yeasts	YT	BUY
Filamentous Fungi (and select yeast species)	FF	2% ME

TABLE 4-1: SELECTING THE CORRECT CULTURE MEDIUM

**Many agriculture organisms should be grown on BUG (w/o Blood). For listing, see Appendix 4.

Preparing Inocula

STOP!

Is your suspension density accurate? Did you calibrate using Biolog's Turbidity Standards?

Once your microbe is isolated and cultured, prepare a liquid inoculum. Refer to instructions enclosed with Biolog MicroPlates for detailed directions. In general:

- The inoculum MUST be within the range specified by the turbidity standards accompanying your database (± 2% T).
- The inoculum MUST be uniformly suspended. If a bacterial organism forms clumps, you will need to use special techniques to achieve a homogenous suspension. (see "Dry Tube Method" page 4.11)

Table 4-2 will help you decide which suspension medium to use:

Organism Type	Inoculating Fluid	Turbidity Standards	Inoculum Density
Gram Negative Non-Enteric	GN/GP-IF	GN-NENT	52% T
Gram Negative Enteric	GN/GP-IF + T	GN-ENT	61% T
Gram Negative Fastidious	GN/GP-IF + T	GP-COC & GP-ROD & GN-FAS	20% T
Gram Positive Cocci Gram Positive Rods (non-spore forming)	GN/GP-IF + T	GP-COC & GP-ROD & GN-FAS	20% T
Gram Positive Rods (spore forming bacillus)	GN/GP-IF	GP-ROD SB	28% T
Anaerobes	AN-IF	AN	65% T
Yeasts	Sterile water	YT	47% T
Filamentous Fungi (and select yeast species)	FF-IF	FF	75% T

TABLE 4-2: SELECTING THE CORRECT INOCULATING FLUID, TURBIDITY STANDARDS, AND CELL DENSITY

Adding thioglycolate to inoculating fluid

Some microbes (see Table 4-2) require the addition of thioglycolate (T) to the inoculum. Thioglycolate acts as an anticapsule agent; it decreases production of bacterial capsules so that strains give more consistent patterns. Biolog provides you with droppers of thioglycolate. To add thioglycolate:

Don't forget to add thioglycolate when working with:

GN Enteric
GN Fastidious
GP Cocci & Rods

1. Hold reagent dropper upright and point tip away from you. Using a dissecting hemostat fully crush ampule close to it's center one time only. Tap the bottom on benchtop a few times.

C***aution: Do not manipulate dropper any further, as the plastic may puncture, causing injury.***

2. Invert the dropper for convenient drop-by-drop dispensing of reagent.

3. Dispense precisely 3 drops of concentrated thioglycolate into your inoculating fluid. Do not use more than 3 drops per 18-20 ml. This gives you a 5 mM final concentration.

4. Each dropper contains about 15 drops. You can continue to use an open dropper for the rest of the day, and then discard the remainder.

Remember, your microbes are alive. Treat them with care. Use fresh cultures.

Adding sodium salicylate to inoculating fluid

If gram-positive bacteria are false positive even after you've added thioglycolate to the inoculating fluid, try adding sodium salicylate:

1. Add thioglycolate as described above.

2. Add 1 ml of sterile 100 mM sodium salicylate to 18-20 ml of GN/GP-IF.

3. Proceed with sample preparation.

Caution!
Use special care!

Do not excessively vortex FF-IF suspensions. The FF-IF is viscous.

It will trap air bubbles that will interfere with absorbance readings.

Preparing inocula

Once you've added thioglycolate (if necessary), prepare the inocula:

1. Establish the appropriate turbidity range on your turbidimeter by adding and subtracting 2% T to the percent transmittance measured with the appropriate turbidity standard.

2. Dip a sterile swab into the inoculating fluid to moisten it.

3. Lift cells from the agar by rolling the swab over the colonies, rather than sliding across them. Be sure not to pick up any agar.

4. Twirl the swab against the inside surface of the tube (above the fluid line) to gently dissolve colonies.

5. Dip the swab into the fluid and stir with a up-down motion to the bottom of the tube to create a uniform suspension. You can also use a sterile transfer pipette to mix without creating an aerosol. Recap the tube and invert if using Biolog's GN/GP-IF.

6. Adjust the inoculum density so it is within the specified turbidity range. You can change the density by adding more cells (to increase density) or more inoculating fluid (to lower density). Be sure to vortex or mix gently before taking the final reading.

7. Examine your suspension and make certain that it is homogeneously suspended and free of clumps. It is essential that the cell suspension does not contain clumps. If there are only a few clumps, allow them to settle to the bottom, pouring off the supernatant. *If the bacterial suspension is not homogenous, use the special dry tube procedure described in* ***Step 4 on page 4.11 and in Section 10.***

8. For anaerobic bacteria, prepare the suspension in batches of no more than six at a time. The time from beginning the first suspension to finishing the last suspension should not exceed 5 minutes.

Special Procedures for Spore-Forming Gram-Positive Rods

This section describes the procedure and details the techniques found to provide consistent identification of spore-forming gram-positive rods (Bacillus species). Bacillus species require a special agar media and streaking technique to keep cells in a vegetative growth phase and minimize spore formation. Most species are strong producers of capsular polysaccharide. This polysaccharide material interferes with cell testing and causes cells to clump, making it difficult to prepare cell suspensions. Thioglycolate is used in this special procedure to reduce polysaccharide production. Preparing a uniform cell suspension free from clumps is important for accurate identification.

Always use the following special swabbing and streaking technique with *Bacillus* species:

1. Isolate a pure culture of the Spore-Forming Gram-Positive Rod.
2. Subculture the spore-forming gram-positive rod on BUG plus Maltose plus Thioglycolate (BUG + M + T). This will stimulate cells into vegetative growth phase and decrease cell clumping. Prepare the agar media according to the following procedure.

    a. Add 8 drops of thioglycolate (Biolog P/N 73011) from the dropper ampoule into 3 mL of sterile water. Mix thoroughly.

b. Use a sterile swab (Biolog P/N 3023 or 3021) wet with the thioglycolate solution to spread a thin film across the entire surface of the BUG + M agar plate (Biolog P/N 71103).

c. Allow the thioglycolate to dry on the agar before streaking the spore-forming gram-positive rod strain (takes about 5 minutes).

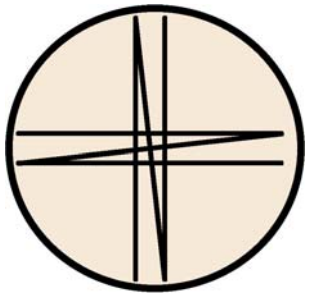
3. With a Biolog sterile Streakerz™ stick (Biolog P/N 3025 or 3026), touch an isolated colony and transfer to the BUG + M + T agar media. Make a plus sign (+) on the center of the agar media. See Figure 1.

   a. If the organism is a fast grower and spreads, make a single very thin plus sign (+). This will avoid overgrowth and sporulation.

   b. If the organism is a very slow grower and does not spread then make up to three (3) streaks in the shape of the letter N in each direction of the plus. Leave a small distance between the three streaks to promote vegetative growth on all three streaks. Prepare multiple agar plates (2 to 3) to insure that enough cells are available to prepare the inoculation suspension.

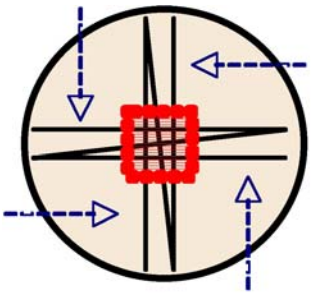
Figure 1: Plus Format to Streak

A



PLUS "+" STREAKING METHOD

B



CELL GROWTH AFTER INCUBATION

   c. The goal of this streaking technique is to limit cell growth to one (1) to three (3) lines so that the cells along the edges have a good supply of nutrients. This keeps the cells in an active state and decreases sporulation.

4. Incubate at 30°C for 16-20 hours; do not exceed 16 hours for fast-growing strains.

5. Prepare a cell suspension with the following "**Dry Tube Method**" for mucoid or dry colony types.

    a. Use a sterile, dry glass test tube.

    b. Using a Streakerz stick, take cells starting at the ends and edges of the "Plus" sign as shown by the arrows in the Figure 1. The cells located outside the boxed area illustrated in Figure 1 are the most metabolically active cells. Avoid picking cells from the boxed area that are more likely to have sporulated. Be careful not to scrape up agar from the plate while harvesting the cells.

    c. Some mucoid strains as well as strains that become embedded in the agar may not adhere to the Streakerz stick making it difficult to transfer cell mass to the dry test tube. In this case, use the edge of a sterile microscope slide to scrape across the inoculation lines on the agar plate and recover cell mass. Be careful not to dig in to the agar. Transfer the cell mass from the slide to the inner wall of a dry test tube with the aid of a Streakerz stick.

    d. Crush and break up the cell mass against the side of the tube. Use an up and down motion in combination with a circular motion to crush and spread the cells against the inner wall of the dry glass tube. Continue until a sufficient mass of cells adheres to the wall of the glass tube forming a uniform thin film on the inside surface free of clumps.

    e. Transfer approximately 5 mL from a tube of GN/GP-IF (Biolog P/N 72101) into the glass tube containing the cells. Use an up and down rubbing motion to slide the bacterial film from the tube wall downward, into the GN/GP-IF. Continue until all cells are suspended in the inoculation fluid.

    f. Examine the cell suspension. Hold the tube up to the light and see if the cells are completely suspended or if clumps and strings remain. If clumps or strings remain, follow one these methods to remove them:

        Method 1: If the suspension is a mixture of single cells and clumps, let the mixture stand at room temperature until the clumps and debris have settled to the bottom. Use the homogenous cell suspension layer free of debris. If the suspension contains only strings and clumps (observed with highly mucoid strains like *Bacillus amyloliquefaciens and licheniformis*), place the suspension test tube in a warm (36 ± 1°C) incubator or water bath for up to 20 minutes. The heat

aids in liquefying the cell mucous. Swirl the contents of the tube occasionally during the incubation. Look for the disappearance of the distinct mucoid strings as evidence that the sample is ready.

Settling of the debris is critical to eliminating clumps and obtaining a homogeneous cell suspension for accurate identification. This step may take up to 20 minutes.

OR

Method 2: Filter the cell mixture through a 70 µm cell strainer (BD Falcon™ 352350) to pull out the cell debris from the homogeneous cell suspension.

g. Prepare a homogeneous cell suspension. Place a new tube of GN/GP-IF into the Biolog Turbidimeter. Adjust the zero of the turbidimeter for the tube. Carefully remove the homogenous cell suspension using a transfer pipette (Biolog P/N 3019) making sure that the cell debris in the bottom of the tube is not taken. Add the cell suspension drop wise, with mixing to the tube of GN/GP-IF in the turbidimeter. Use a swab to stir and mix the cell suspension into the GN/GP IF. Continue to add cells to achieve a cell turbidity of 28% ± 2%. Uniformly suspended cells typically give stable turbidimeter readings whereas remaining clumps and strings cause the turbidimeter to fluctuate as they pass across the light path. Remaining clumps can be removed by letting the tube stand until the clumps settle. Remove the uniformly suspended cells to inoculate the MicroPlate.

h. If more cells are needed to get the required cell density, repeat the dry tube method preparation using a new empty, sterile dry glass tube. Do not use the same tube that is wet with GN/GP-IF.

6. Inoculate a GP2 MicroPlate™ following the procedure in the Instructions for Use.
7. Incubate at 30°C for 4 – 6 hours and/or 16 – 24 hours to allow the pattern to form.

General hints for handling *Bacillus*

- ☑ Always grow *Bacillus* species on BUG + M + T for identification.
- ☑ Keep the incubation time on BUG + M + T as short as possible to reduce sporulation (i.e., incubate for 16 rather than 24 hours if the organism grows fast).
- ☑ For slow growing strains you may need to use multiple (2 to 3) BUG + M + T agar plates to obtain enough cell mass.
- ☑ Use the dry tube method described above to properly prepare the inoculum. Allow the suspension to stand until all clumps settle to the bottom of the tube. Be patient.
- ☑ *Bacillus cereus* and *Bacillus thuringiensis* are considered indistinguishable by biochemical assays. These two species are listed in the Biolog database as *Bacillus cereus/thuringiensis*. *Bacillus anthracis* is also very closely related to these taxa.

Special Procedures for Filamentous Fungi

Because of their potentially pathogenic nature, filamentous fungi need special care and handling.

Laboratory Safety[1]

Sporulating cultures require extra handling precautions to prevent spores or conidia from escaping into the air. Manipulating sporulating cultures can sometimes present a risk of infection or allergy, contaminate laboratory air, and contaminate bacterial cultures. We recommend that filamentous fungi be handled in a biological safety cabinet. This practice also diminishes the risk of infection by dimorphic fungal pathogens.

Follow the guidelines in this chapter for all specimen preparation, characterization, inoculum preparation, and MicroPlate inoculation.

General hints for handling filamentous fungi

1. Incubate subcultured filamentous fungi in a closed container. Place the agar plates in a plastic container or in sealed plastic bags on trays.

[1] Several organizations have published guidelines for laboratory safety in microbiology – the Centers for Disease Control and National Institutes of Health (1988), the Medical Research Council of Canada (1990), and the World Health Organization (1993).

2. Do **NOT** add a source of moisture to this container. Mycelial growth will overwhelm the agar plate and cause crossover contamination of other cultures.

3. Incubate the 2% ME agar at 26° C for 5-10 days to induce conidia formation (incubate longer if required). Incubate yeasts for 1-2 days.

Inoculating MicroPlates

Inoculate the suspension into one of the following Biolog MicroPlates:

- GN2: For all gram-negative aerobic bacteria
- GP2: For all gram-positive aerobic bacteria
- AN: For all anaerobic bacteria
- YT: For all yeasts visceral
- FF: For all filamentous fungi and select yeast strains

Caution!
Pipet the inoculum into a MicroPlate within 20 minutes! Use sterile technique.

Pipet the inoculum into a Biolog MicroPlate within 20 minutes. Waiting any longer may cause inaccurate identification. Anaerobic bacteria are especially sensitive to delays. If you are running a batch of MicroPlates, set them up (from preparing the inoculum to pipetting into the MicroPlate) so you will not exceed the 20 minute deadline.

Inoculating protocol

1. Label the MicroPlate with the organism name/number and plate type (e.g., GN, GP). Label the side of the MicroPlate itself, not the lid.

2. Using aseptic technique, pour the cell suspension into a multichannel pipette reservoir.

Caution!
Accurately pipet recommended volumes.

3. Firmly attach eight sterile tips to the pipettor.

4. Fill the tips with the suspension. Check to see that all tips fill equally.

5. Prime the tips by dispensing once back into the reservoir. The electronic pipettor will do this automatically.

6. Fill all MicroPlate wells by placing the tips at an angle inside the top of the wells . Take care not to splash from one well to another. Avoid contamination. Avoid touching the bottom of the wells, which could transfer carbon sources.

   - Gram negatives and gram positives ➔ 150 µl per well
   - Anaerobes, yeasts and filamentous fungi ➔ 100 µl per well

7. If the fluid level in the tips gets low, refill and continue dispensing until all wells are full.

8. Cover the MicroPlate with its lid.

Incubating MicroPlates

As soon as you dispense the suspension, incubate the MicroPlate using the appropriate temperature, atmosphere, and time conditions. Table 4-3 (page 4-15) and Appendix 2 will help you select the correct conditions.

- For aerobes: Use a moist chamber during incubation to prevent evaporation. A plastic container with wet paper towels on the bottom should be sufficient.

- For filamentous fungi: MicroPlates must be incubated in a closed container or in sealed plastic bags on trays. Do not add a source of moisture. Mycelial growth will overwhelm the MicroPlate and cause reaction crossover within the MicroPlate.

MicroPlates of aerobic bacteria can be read after 4-6 hours of incubation. If reactions are insufficient, read again at 16-24 hours.

Organism Type	Temperature	Atmosphere	Incubation Time
Gram Negative Non-Enteric	30° C	Air	4-6 and 16-24 hours
Gram Negative Enteric	35-37° C	Air	4-6 and 16-24 hours
Gram Negative Fastidious	35-37° C	6.5% CO_2	4-6 and 16-24 hours
Gram Positive Cocci Gram Positive Rods (non-spore forming)	35-37° C or 30° C or 26° C (if required)	Air or 6.5% CO_2 (if required)	4-6 and 16-24 hours
Gram Positive Rods (spore forming bacillus)	30° C or 55° C (if required)	Air	4-6 and 16-24 hours
Anaerobes	35° C or 30° C or 26° C (if required)	Anaerobic-H_2 free	20-24 hours
Yeasts	26° C	Air	24, 48, or 72 hours
Filamentous Fungi (and select yeast species)	26° C	Air	24, 48, 72 or 96 hours

TABLE 4-3: SELECTING CORRECT INCUBATING CONDITIONS

Special Procedures for Incubating Anaerobic MicroPlates

1. In most cases, leave AN MicroPlates in their foil pouch until immediately before inoculation. The only exception is if you presume your organism is either *Bacteroides* or *Prevotella*. If your gram-negative rod is resistant to kanamycin (see page 4.5) and has grown well enough overnight to prepare a suspension, open the AN MicroPlate foil pouch and expose it to air for 20 minutes before inoculation.

2. For all species, keep the air exposure time consistent. Do **NOT** exceed 5 minutes between the time you begin and end inoculating AN MicroPlates for a single run. You should be able to inoculate six MicroPlates in 5 minutes. If the run requires more than six MicroPlates, use two people or divide the number of suspensions into smaller batches.

Caution!

If you're working with anaerobes:
➔Use anaerobically prepared media.
➔Inoculate MicroPlates in air.
➔After inoculation, wait 10 minutes before moving the MicroPlates into a hydrogen-free anaerobic jar.

3. Wait 10 minutes after inoculating the AN MicroPlate before placing it in an anaerobic jar. This is necessary to slightly oxidize the buffer.

   - Rectangular jars can hold six or 24 MicroPlates, are easy to work with, and are inexpensive
   - 3.5 liter jars hold up to nine MicroPlates
   - 10.5 liter jars hold up to 28 MicroPlates and can stand upright

4. Use an anaerobic, atmosphere-generating system that does not produce hydrogen. Organisms with strong hydrogenases will reduce the tetrazolium in all wells if hydrogen is present. Add an anaerobic indicator strip to monitor the atmosphere. Call Biolog Technical Service for suggestions on where to find anaerobic supplies.

5. Incubate most anaerobes at 35° C for 20-24 hours.

6. After incubation, check the color of the MicroPlates before you open the anaerobic jar. MicroPlates should be clear with purple wells. Once you expose them to air, negative wells will slowly take on a faint green-blue color. If this green-blue color is present before you open the jar, the atmosphere was probably not fully anaerobic.

Sample Preparation Process

For Filamentous Fungi		
Initial Culture Medium	2% ME	2% ME
Wet Prep Results	Hyphal elements	Yeast cells
Microbe Type	Filamentous Fungi	Yeast
Culture Medium	2% ME	2% ME
Temperature	26° C	26° C
Atmosphere	Air	Air
Culture Incubation Time	5 - 10 days	2 days
Inoculating Fluid	FF-IF	FF-IF
Inoculum Turbidity/ Turbidity Standard	75% T FF	75% T FF
MicroPlate Type/µl per well	FF 100	FF 100
Incubation time (hours)	24, 48, 72, 96	24, 48, 72, 96

ABBREVIATIONS

2% ME	= 2% Malt Extract Agar
FF	= Filamentous Fungi
%T	= percent transmittance
IF	= inoculating fluid

Sample Preparation Process For Gram Negatives, Gram Positives, Anaerobes and Yeasts

Initial culture medium	BUG + B*					BUA + B	BUY
	Gram stain and observe cell morphology						
Gram stain results	↓ Gram Negatives ↓			↓ Gram Positives ↓		Anaerobes ↓	**Yeasts** ↓
Characterization test	Oxidase positive requires 30° C	Oxidase negative and TSI=A/A or K/A	Requires CO_2 or chocolate agar or < 1 mm colonies on BUG + B			Kanamycin test for rapidly-growing, gram-negative rods	
Characterization test	Oxidase negative and TSI=K/K or K/A^{w}						
Microbe type	GN-NENT	GN-ENT	GN-FAS	GP-COCCUS-ROD, GP-COCCUS, GP-ROD	GP-ROD SB (spore-forming bacillus)	AN	**YT**
Culture medium	BUG + B or TSA + B	BUG +B or TSA + B	Chocolate	BUG + B	BUG + M + T (8drops in 3ml H2O) "+"streaking	BUA + B	BUY
Temperature	Typically 30º C	Typically 35-37º C	Typically 35-37º C	Typically 35-37º C	Typically 30º C	Typically 35-37° C	26° C
Atmosphere	Air	Air	6.5% CO_2	Air or 6.5% CO_2 (if required)	Air	ANA-H_2 free	Air
Inoculating fluid	GN/GP-IF (if A1 well is pos, add thioglycolate)	GN/GP-IF + T (3 drops)	GN/GP-IF + T (3 drops)	GN/GP-IF + T (3 drops) (if A1 well is pos, add 1 ml salicylate)	GN/GP-IF (NO THIO)	AN-IF	Water
Inoculum turbidity/ Turbidity standard	52% T GN-NENT	61% T GN-ENT	20% T GP-COC & GP-ROD & GN-FAS	20% T GP-COC & GP-ROD & GN-FAS	28% T GP-ROD SB	65% T AN	47% T YT
MicroPlate type/ µl per well	GN2 150	GN2 150	GN2 150	GP2 150	GP2 150	AN 100	YT 100
Incubation time (hours)	4-6, 16-24	4-6, 16-24	4-6, 16-24	4-6, 16-24	4-6, 16-24	20-24	24, 48, 72

**Note: Agricultural bacteria may be grown on BUG without blood.and at 30° C for enterics.*

ABBREVIATIONS
TSI = Triple Sugar Iron Slant; A = Acid, A^{W} = Weak Acid, K = Alkaline; BUG + B = Biolog Universal Growth Medium + blood; BUG + M = Biolog Universal Growth Medium + maltose; T = thioglycolate; %T = percent transmittance; GN-NENT = gram-negative non-enteric; GN-ENT = gram-negative enteric; GN-FAS = gram-negative fastidious; GP-COCCUS & GP-COC = gram-positive cocci; GP-ROD = gram-positive rod; GP-ROD SB = gram-positive rod, spore-forming bacillus; AN = anaerobe; YT = yeast; IF = inoculating fluid

5. Reading MicroPlates

In this section:

Depending on which MicroStation/ MicroLog software version you are using, the process of reading MicroPlates can be done in a simplified way or using the detailed method of creating worksheets.

- MicroLog 1 software offers only the simplified reading process (entering MicroPlate reactions manually' "by eye", printing the results, and interpreting the results.
- MicroLog 2 software uses the same manual reading process as the MicroLog 1 but also allows you to save results, as well as create a user built database.
- MicroStation/ MicroLog 3 software allows you to create worksheets to read multiple MicroPlates, save files, work with databases, and use advanced functions (such as cluster analysis and threshold adjustment)

Logging-In

Unless the software has been set up to run in Unrestricted mode, the MicroStation system/ MicroLog software will always require user log-in before beginning the process of entering information and reading MicroPlates.

Follow the instructions for logging-in on page 3.2.

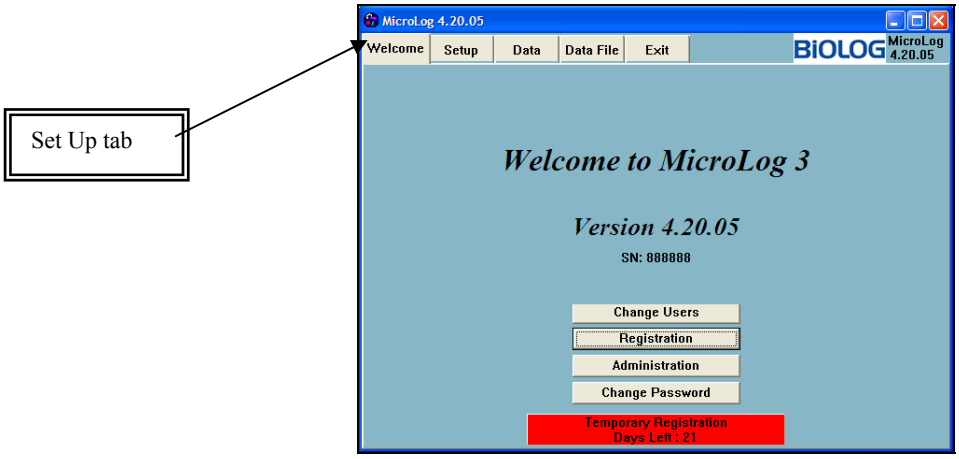
Choosing Manual, Reader or File Mode

You can run the identification process in three modes:

- **Manual** mode allows you to enter MicroPlate reactions by hand SEE Section 5, Page 3
- **Reader** mode is used in conjunction with the MicroStation reader, where MicroPlate reactions are read and entered automatically. SEE Section 5, Page 7
- **File** mode lets you recall and view MicroPlate data already stored in a file. SEE Section 5, Page 10

Note: While running in Restricted mode, you have access to these features only if you have "Log-In" and "Set Up" privileges.

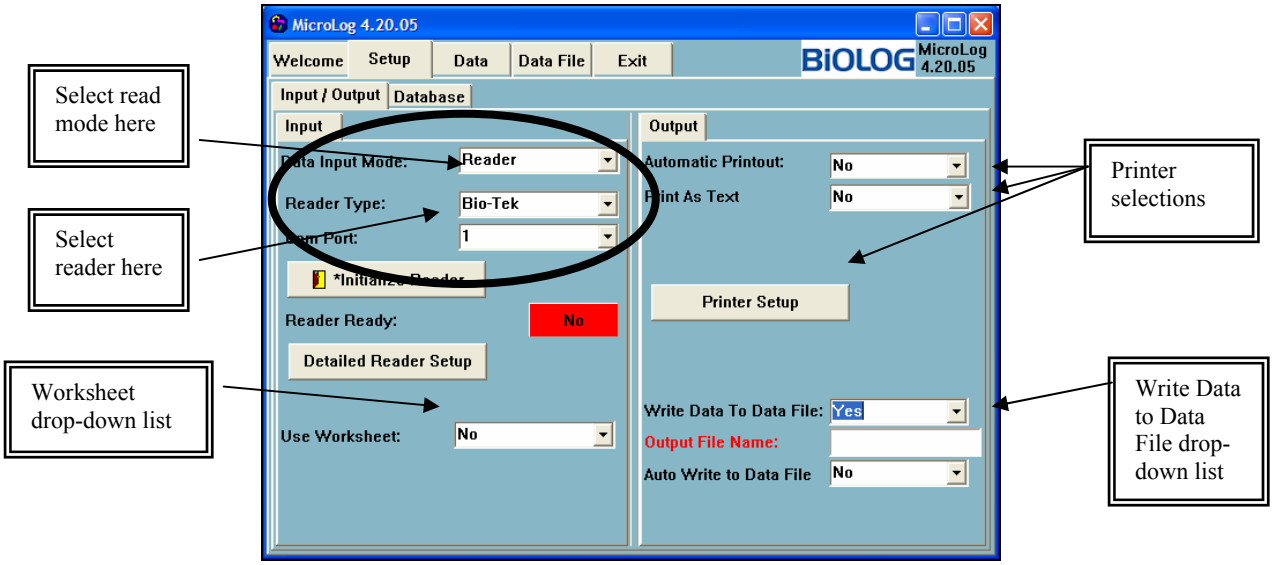
To select whether you want to work in manual, reader, or file mode, click the **Set Up** tab on the **Welcome** window.



WELCOME WINDOW

Selecting Data Input (Read) mode

1. Use the **Data Input Mode** drop-down list to select **Manual, Reader, or File**.



SET UP WINDOW (WITH MANUAL MODE SELECTED)

2. Select the correct MicroStation reader. **Molecular Devices** or **Bio-Tek.**

3. Select **Yes** or **No** in the **Use Worksheet** drop-down list. For further information on using a worksheet, see Section 5, page 12-16.

4. Select **Yes** or **No** in the **Write Data to Data File** drop-down list. For further information on writing to a data file, see Section 5 pages 15-16. **Note:** If the program is operating in **Restricted Access Mode,** this option defaults to **Yes,** and only users with **SET UP** privileges have the ability to change this option**.**

Choosing printer method

1. Click the **Automatic Printout** drop-down list on the **Set Up** window to select **Yes** (if you want to automatically print out your result) or **No** (if you don't want automatic printout).

2. Click the **Print in Text Mode** drop-down list to select **Yes** (if you want speedier printing) or **No** (if you want higher resolution printing).

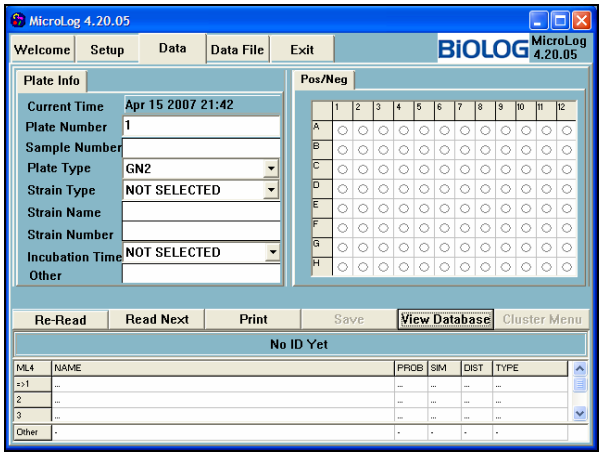
3. Click the **Printer Setup** bar if you need to select a printer. This bar is not necessary for text printing and will disappear if you select text mode.

Reading Plates Manually

1. Use the Data Input Mode drop down menu to select **Manual** as the Data Input Mode.

2. Click the **Data** tab on the Menu Bar. The **Data** window appears.

Caution!
Entering reactions manually is NOT recommended for YT and FF MicroPlates.



DATA WINDOW (IN MANUAL MODE)

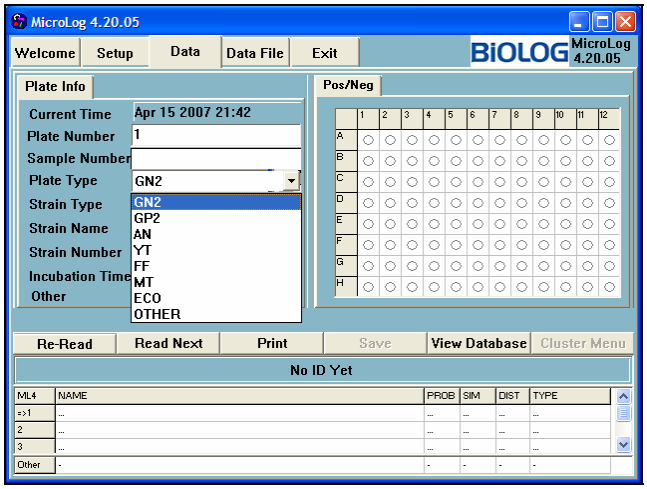
Entering sample identifiers

When you're entering sample identifiers, make sure you select the correct strain type. The default entry in that field is "NOT SELECTED." If default strain type is selected, no database will be searched

1. **Current Time:** Your computer's clock automatically tracks time.

2. **Plate Number:** Type in the MicroPlate number.

3. **Sample Number:** Type in the sample ID number.



SAMPLE IDENTIFIER SECTION OF DATA WINDOW

4. **Plate Type:** Use the drop-down list to select the type of MicroPlate you used.

5. **Strain Type:** Use the drop-down list to select the strain type you are working with.

- For an initial bacterial query use one of the following: GN-NENT, GN-ENT, GN-FAS, GP-COCCUS, GP-ROD, GP-ROD SB, AN-ALL (use the NON-APPLICABLE default for other MicroPlate types.)

- Secondarily, use GN-ALL or GP-ALL to screen organisms of questionable type and morphology as required.

- If an ID is obtained using GN-ALL or GP-ALL be sure to check that the correct protocol for that ID was used.

- For FF query Use the FF-AIR or FF-FOOD database for FF MicroPlates, depending on the source of the organism to be identified. These databases also contain the most commonly isolated species from the other databases (Yeast, Aspergillus, Colletotrichum, Fusarium, Penicillium, Trichoderma). The other

databases are intended for use by researchers working on specific genera, not for routine food and air isolates.

6. **Strain Name, Number**: If you have additional information, enter it in these optional fields.

7. **Incubation Time:** Use the drop-down list to select the hours that the MicroPlate has incubated.

Note: A 240-hour incubation time is listed for the FF database, however, there is no database for 240 hours. That listing is a research tool.

Remember: Light purple reactions are considered positive as long as the color is noticeable when compared to the A1 reference well.

8. **Other:** If you have additional information, enter it in this optional field (colony morphology, culture conditions, etc.). An optional comment can be entered in this field.

Entering reactions manually

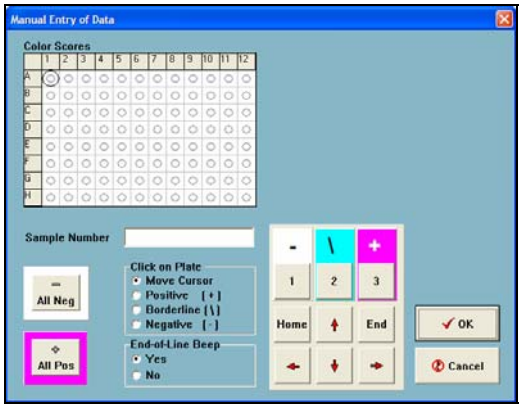
Entering reactions in manual mode requires visual assessment of MicroPlate reactions.

Table 5-1 will guide your visual assessment:

Color Density	How To Assess It
Same as A1 well (usually colorless)	Negative
Noticeable purple color (more than A1 well)	Positive
Extremely faint color, Not sure	Borderline

TABLE 5-1. VISUALLY ASSESSING WELL COLOR DENSITY

1. From the **Data** window, click **Read Next** (directly under sample information). The **Manual Entry of Data** window appears.



MANUAL ENTRY OF DATA WINDOW (TO ENTER MICROPLATE REACTIONS)

2. Enter reactions into the on-screen MicroPlate, using any of the methods shown below.

3. Click **OK** to read the Plate

4. The **Data** screen appears and displays the read result.

SELECT YOUR PREFERRED WAY TO MANUALLY ENTER REACTIONS

Mouse Keypad or Keyboard Method

Use your mouse to maneuver around the on-screen keypad or use the computer keyboard to enter reactions on the Manual Entry of Data window.

"1" key	➔	negative
"2" key	➔	borderline
"3" key	➔	positive
up and down arrows	➔	use to navigate around the wells
"home" key	➔	returns cursor to A1 well
"end" key	➔	moves cursor to H12 well

Mouse Cursor Method

Select the radio button you want, then click your cursor in desired wells. With this method, you can also click and drag across areas to change large blocks of wells.

● Positive	➔	makes selected well(s) positive
● Borderline	➔	makes selected well(s) borderline
● Negative	➔	makes selected well(s) negative

All or Nothing Method

One click to make the whole MicroPlate positive or negative, then use radio buttons and your cursor to make alterations.

■ – All Neg	➔	makes all wells negative
■ + All Pos	➔	makes all wells positive

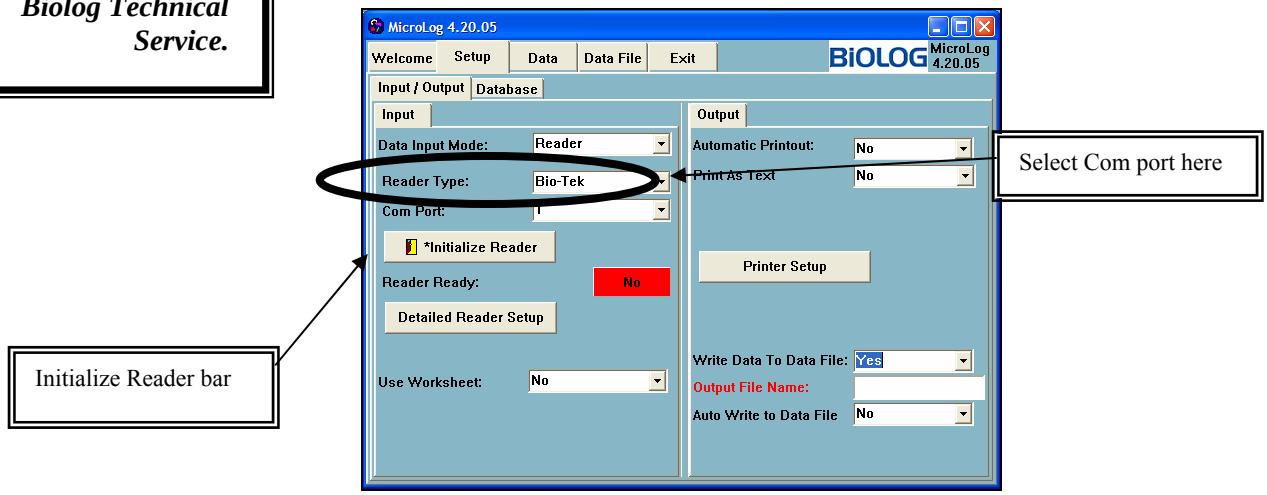
Reading Plates Using the Plate Reader

> Caution!
> ***The Detailed Reader Setup window contains troubleshooting tools. Don't change anything without consulting Biolog Technical Service.***

1. Use the **Data Input Mode** drop-down list to select **Reader** (to use the reader).

2. Select the correct MicroStation reader. **Molecular Devices** or **Bio-Tek**.

3. The **Initialize Reader** and **Detailed Reader Setup** selection bars appear. Use the **Com Port** drop-down list to assign communications (com) port 1 thru 5.



SET UP WINDOW (WITH READER MODE SELECTED)

4. Click the **Initialize Reader** selection bar. The **Reader Ready** field changes from **No** (red) to **Yes** (green).

*Note: If the Reader Ready field does not change to **Yes** (green) after 1 minute, make sure the reader is connected properly and turned on. See Section **11** if you have trouble initializing the reader.*

5. Select **Yes** or **No** in the **Use Worksheet** drop-down list. For information on using a Worksheet see Section 5, Page 11-14.

6. Select Yes or No in the **Write Data to Data File** drop-down list. For information on Saving Files see Section 5, page 15-16.

Entering Reactions Using the Reader

** For FF strain type query see section 4 page 5.*

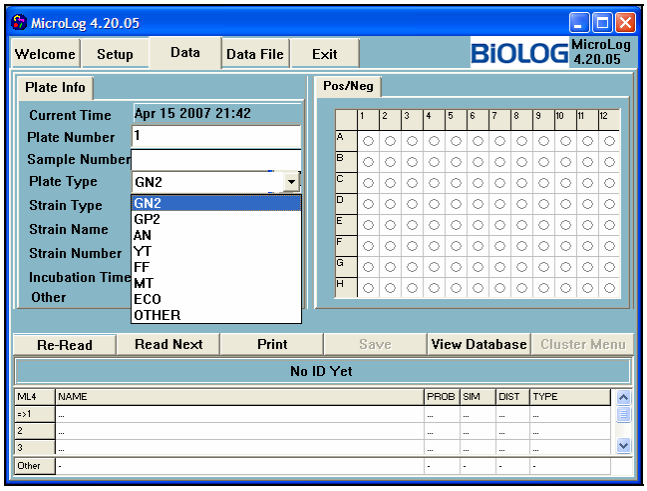
1. Make sure the reader is initialized (on the Set Up window).
2. Enter sample identifiers.

Entering sample identifiers

-**Current Time:** Your computer's clock automatically tracks time.

-**Plate Number:** Type in the MicroPlate number.

-**Sample Number:** Type in the sample ID number.



SAMPLE IDENTIFIER SECTION OF DATA WINDOW

-**Plate Type:** Use the drop-down list to select the type of MicroPlate you used.

-**Strain Type:** Use the drop-down list to select the strain type you are working with.

a. For an initial bacterial query use one of the following: GN-NENT, GN-ENT, GN-FAS, GP-COCCUS, GP-ROD, GP-ROD SB, AN-ALL (use the NON-APPLICABLE default for other MicroPlate types.)

b. Secondarily, use GN-ALL or GP-ALL to screen organisms of questionable type and morphology as required.

c. If an ID is obtained using GN-ALL or GP-ALL be sure to check that the correct protocol for that ID was used.

d. For FF query Use the FF-AIR or FF-FOOD database for FF MicroPlates, depending on the source of the organism to be identified. These databases also contain the most commonly isolated species from the other databases (Yeast, Aspergillus, Colletotrichum,

Fusarium, Penicillium, Trichoderma). The other databases are intended for use by researchers working on specific genera, not for routine food and air isolates.

-**Strain Name, Number**: If you have additional information, enter it in these optional fields.

-**Incubation Time:** Use the drop-down list to select the hours that the MicroPlate has incubated.

Note: A 240-hour incubation time is listed for the FF database, however, there is no database for 240 hours. That listing is a research tool.

-**Other:** If you have additional information, enter it in this optional field (colony morphology, culture conditions, etc.).

-**Comment:** An optional comment can be entered in this field.

Check your MicroPlate before loading. Make sure the reaction pattern is well developed.

3. Wipe the bottom of the MicroPlate to remove condensation and fingerprints.

4. Place the MicroPlate on the reader tray with the A1 well at the top left-hand corner.

5. Gently push the MicroPlate down until it snaps into a level position in the reader tray.

6. Remove the MicroPlate lid.

   Note: For FF, leave the lid on. Replace it with a new lid if condensation is present.

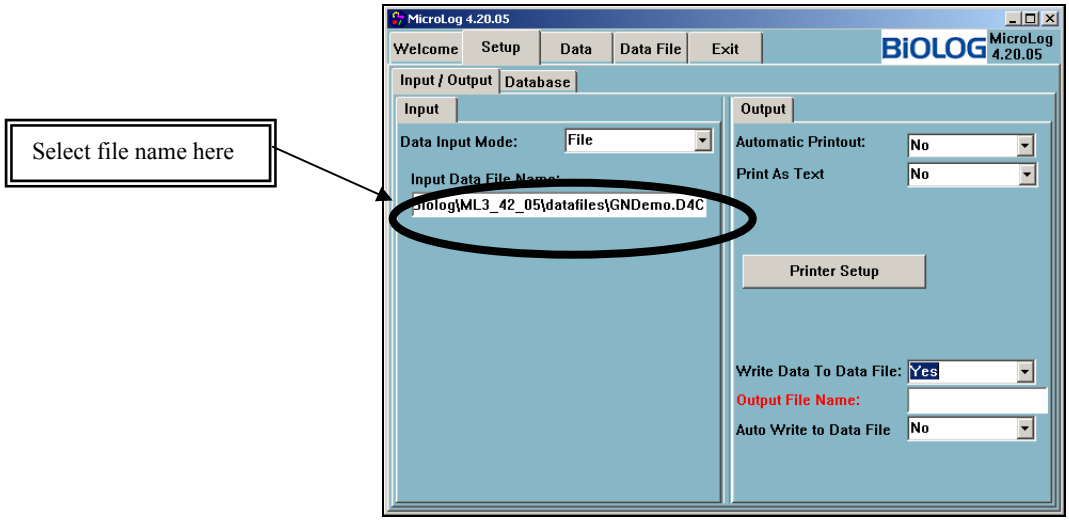
7. Click **Read Next** on the **Data** window.

8. The reader calibrates itself, pulls the MicroPlate inside, takes a reading, displays the result on the **Data** window, and ejects the MicroPlate. Briefly do a visual check of the reaction with the +/b/- called by the auto-thresholding function (see pg 5.20 if adjustment is required).

Reading from a Saved File

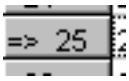
1. Use the **Data Input Mode** drop-down list to select **File** (to view reactions from a saved file)

2. The **Input Data File Name** field appears. Click in the empty field and move through the listed folders to find the file you want to read and click on it. This will bring the file name up on the **Set up** screen.

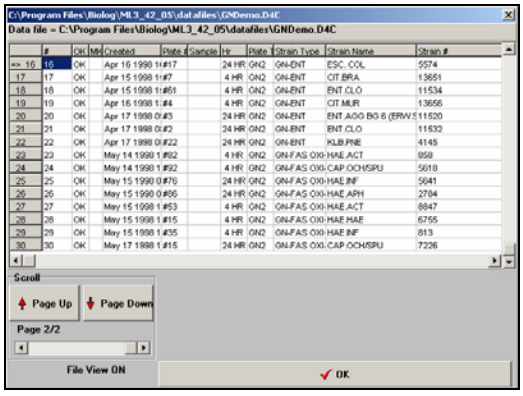


SET UP WINDOW (WITH FILE MODE SELECTED)

3. In the **Write Data to Data File** drop-down list
   a. Select **No**.
4. Click the **Data** tab.
5. Click **Select Read**
6. A list of saved data appears. Select the MicroPlate you want to read and click **OK**.



Arrow indicates selected entry



LIST OF SAVED DATA

7. The Data page will show the record.
    a. Click **Print** to print the record.
    b. Click **Read Next** to view the next record.
    c. Click **Select Read** to select another record.
8. Repeat steps 6 thru 7 to view all records.

Setting Up a Worksheet

Worksheets offer an efficient way to log in and read multiple MicroPlates. By entering multiple sample identifiers and MicroPlate reactions, you simply read MicroPlates sequentially as the worksheet indicates, without stopping to enter more information. If you're working with over five MicroPlates, using a worksheet is faster. If you're reading ten MicroPlates or more, worksheets will save significant time.

Worksheets also allow you to:

- Have one shift set up a worksheet, and the second shift read the MicroPlates
- Avoid entering data fields more than once if you plan to read plates at multiple incubation time points

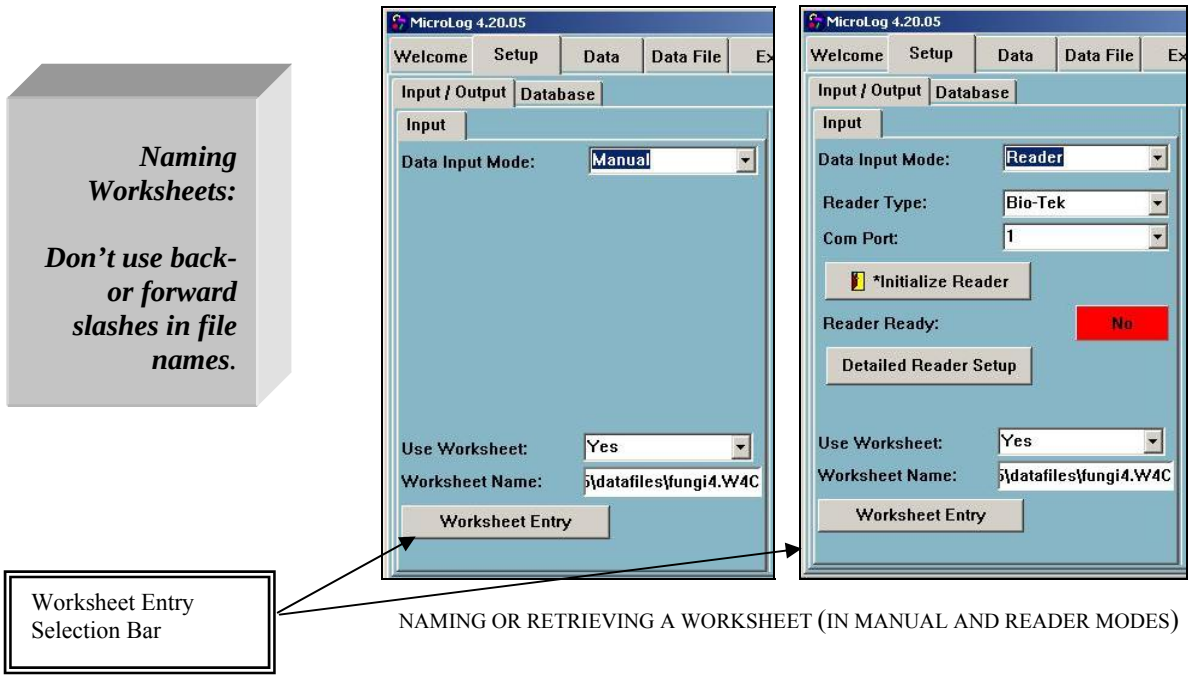
What's a Worksheet?

A worksheet is a spreadsheet within MicroStation/ MicroLog software. Use it to log in and read multiple MicroPlates efficiently.

Printing worksheets gives a record of batch activity. You can use a worksheet whether in manual or reader mode. Worksheet use is optional.

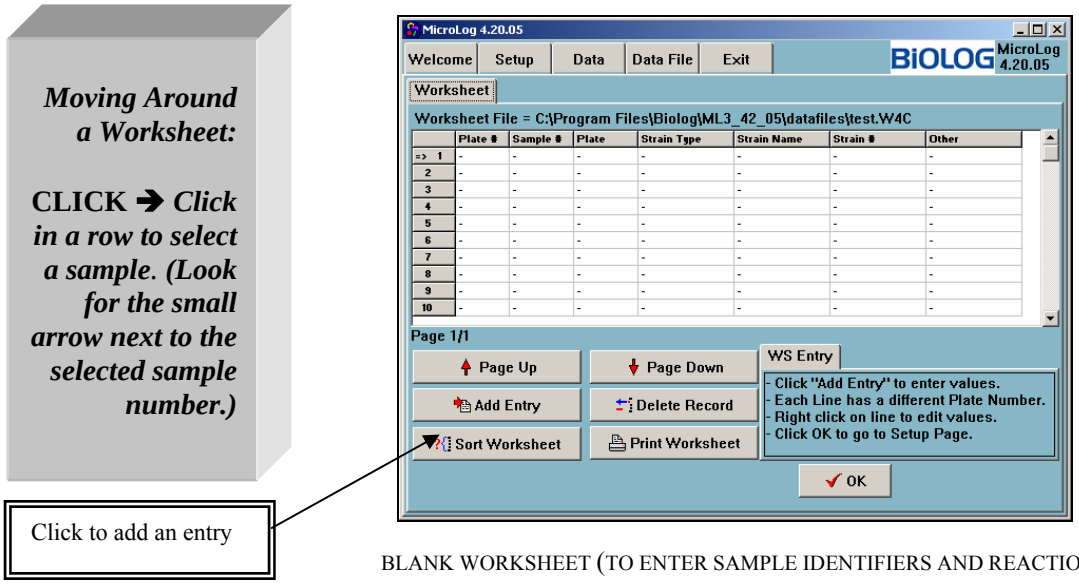
Note: If the program is running in Restricted mode, you have access to this feature only if you have "Log-In" privileges.

1. On the **Set Up** window, select **Yes** on the **Use Worksheet** drop-down list.
2. Click on the **Worksheet Name** field. A **Worksheet File** dialog box appears. Type the desired file name (W4C extension) or choose a previously created worksheet to edit. (Note: Save worksheets that have been created in the "DataFile" folder, or create a separate Worksheet folder. This will assist you in recalling the files at a later date.)



NAMING OR RETRIEVING A WORKSHEET (IN MANUAL AND READER MODES)

3. Click the **Worksheet Entry** selection bar. The **Worksheet** window appears.



BLANK WORKSHEET (TO ENTER SAMPLE IDENTIFIERS AND REACTIONS)

Entering sample identifiers

4. Click **Add Entry**. The **Plate Information** window appears.

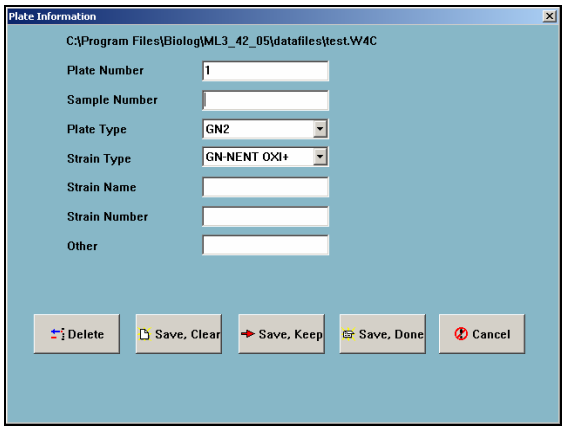


PLATE INFORMATION WINDOW (TO ENTER DATA INTO A WORKSHEET)

5. For each MicroPlate, enter the following information:

   - **Plate Number**: Default begins with 1 (changeable)
   - **Sample Number**: Type in the sample ID number (optional field).
   - **Plate Type:** Use the drop-down list to select the type of MicroPlate you used.
   - **Strain Type:**
     - For an initial bacterial query use one of the following: GN-NENT, GN-ENT, GN-FAS, GP-COCCUS, GP-ROD, GP-ROD SB, AN-ALL (use the NON-APPLICABLE default for other MicroPlate types.)
     - Secondarily, use GN-ALL or GP-ALL to screen organisms of questionable type and morphology as required.
     - If an ID is obtained using GN-ALL or GP-ALL be sure to check that the correct protocol for that ID was used.
     - Use the FF-AIR or FF-FOOD database for FF MicroPlates, depending on the source of the organism to be identified. These databases also contain the most commonly isolated species from the other databases (Yeast, Aspergillus, Colletotrichum, Fusarium, Penicillium, Trichoderma). The other databases are intended for use by researchers working on specific genera, not for routine food and air isolates. The YT MicroPlates does not have a list of strain types from which to choose.

- **Strain Name, Number, Other:** Enter other information in these optional fields. (In the "Other" field, you can enter colony morphology, culture conditions, etc.).

6. After each entry, click the selection bars as desired:

- **Save, Clear** – to save data, to advance MicroPlate numbers incrementally, to clear all fields for entering information on the next MicroPlate

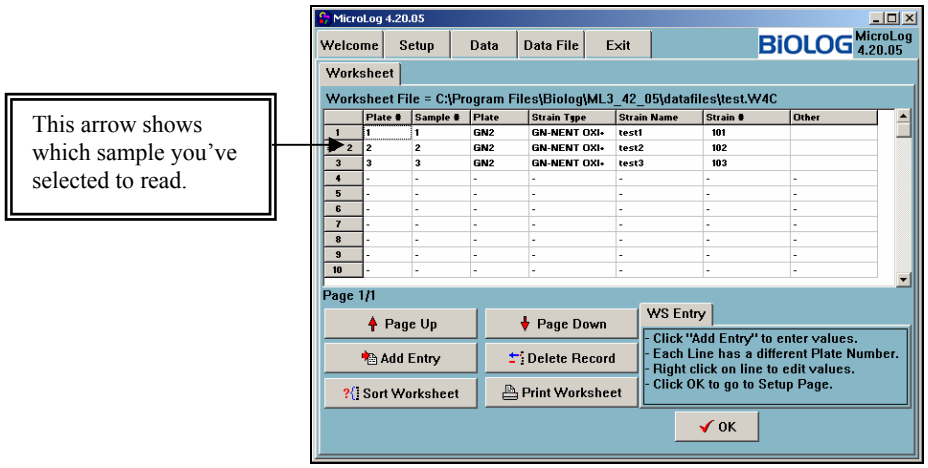
- **Save, Keep** – to save data, to advance MicroPlate numbers incrementally, to keep current entries in all fields

- **Save, Done** – to return to the worksheet

7. When you're finished setting up the worksheet, click **OK**.

Editing a worksheet

1. To edit a worksheet, right click on the row you want to edit. The **Plate Information** window reappears. Edit fields as desired.



WORKSHEET (WITH SAMPLE ENTRIES)

2. Sort entries (Plate Number) by clicking **Sort Worksheet**.

3. To delete an entry click on the row and then click **Delete Record.**

Setting Up to Save Files

Note: If you are planning to compile your own database, see Section 7 before saving files.

If you plan to compile your own database, see Section 7 before saving files.

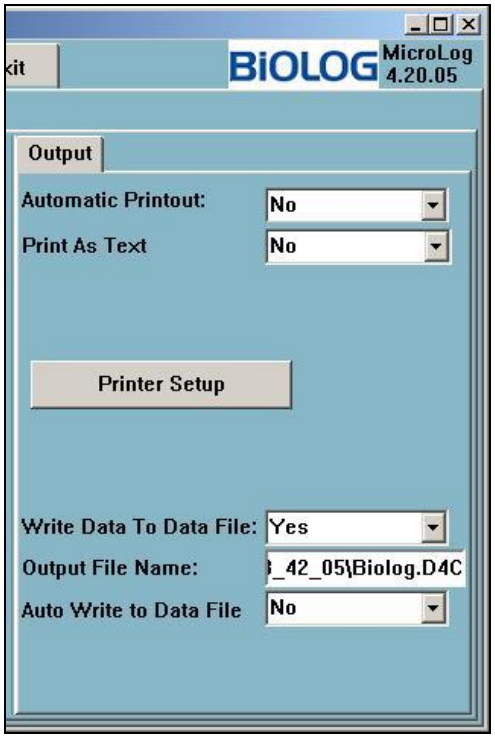
1. Click the **Write Data To Data File** drop-down list on the **Data** window to select **Yes** (if you want the software to save files) or **No** (if you don't want to save files).

*Note: This feature gives a default answer of **Yes** in the **Write Data To Data File** and the **Auto Write to Data File** fields when the program is running in Restricted mode. "Set Up" privileges are required to change these defaults.*

2. If you selected No, the two fields below will close. If you selected **Yes**, two new fields remain. Click on the **Output Data File Name** field. A **Save As** dialog box appears. Enter the desired file name (D4C extension) or choose a previously created data file.

3. Use the **Auto Write To Data File** drop-down list to select **Yes** (if you want to automatically save your results) or **No** (if you don't want to automatically save your results).

Note: For easier editing and compiling of saved data in the future, separate different plate types into individual data files.



CLOSE-UP OF OUTPUT PORTION OF SET UP WINDOW

*Note: If you are working in Restricted mode, new entries are saved as **Read Only** files. Original files cannot be edited. Make a backup for editing.*

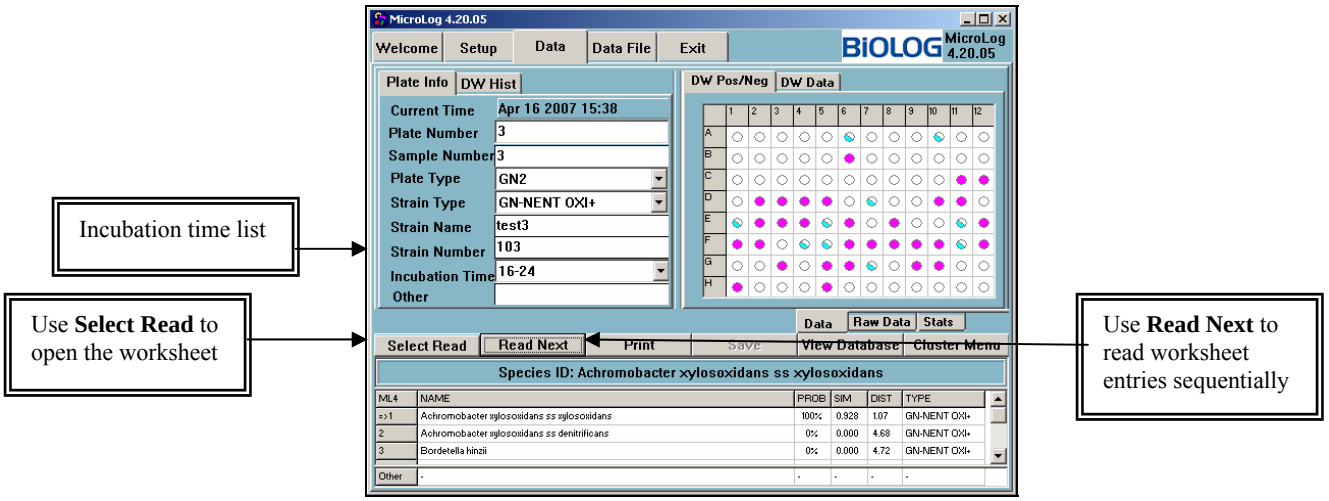
Using Worksheets to Read Multiple MicroPlates

To efficiently read a batch of MicroPlates, use a worksheet. Make sure you're in the desired mode (reader or manual) and that you've selected **Yes** for worksheet use on the **Set Up** window. Select the desired file name.

Reading multiple MicroPlates in manual mode

1. Select **Manual** mode on the **Set Up** window.

2. Click the **Data** tab on the menu bar. The **Data** window appears.



DATA WINDOW

3. Use the **Incubation Time** drop-down list to select the desired incubation time.

4. To read from an open Worksheet:

   - Click **Select Read** to go to the desired worksheet.
   - Click on the sample number you want to read (an arrow will appear next to the sample number you select).
   - Click **OK** to read the MicroPlate. The **Manual Entry of Data** window appears.
   - If necessary, click **Cancel** to return to the worksheet.

5. To read MicroPlates sequentially:

- Click **Read Next** to sequentially read the next MicroPlate on the worksheet without returning to the **Worksheet** window.
- A **Confirmation** window appears. Click **OK** if it displays the MicroPlate you wish to read.
- The **Manual Entry of Data** window appears.
- If necessary, click **Cancel** to return to the **Data** window.

Assessing reactions

Entering reactions in manual mode requires visual assessment of MicroPlate reactions. SEE Section 5, page 5 for more information on reading reactions manually.

Table 5-1 will guide your visual assessment:

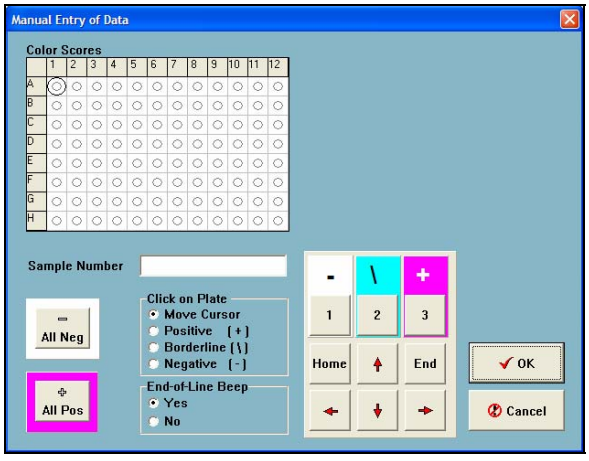
Remember: Light purple reactions are considered positive as long as the color is noticeable when compared to the A1 reference well.

Color Density	How To Assess It
Same as A1 well (usually colorless)	Negative
Noticeable purple color (more than A1 well)	Positive
Extremely faint color. Not sure	Borderline

TABLE 5-1. VISUALLY ASSESSING WELL COLOR DENSITY

Entering reactions

1. Enter reactions into the on-screen MicroPlate using any of the methods shown on page 5.6.
2. Click **OK**.



MANUAL ENTRY OF DATA WINDOW (TO ENTER PLATE REACTIONS)

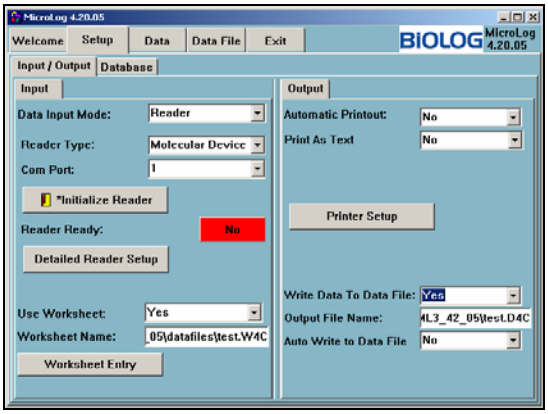
3. Click **Print** to print report (if you did not select Automatic Printout).

4. Click **Save** to save data (if you did not select Auto Write to Data file.)

5. Repeat Steps 1-4 for all MicroPlates.

Reading multiple MicroPlates in reader mode

1. Select **Reader** on the **Set Up** window. SEE Section 5, page 7 for further information on using the Reader.



SET UP WINDOW (TO SELECT READER MODE AND INITIALIZE READER)

2. Click **Initialize Reader** to set up the reader. Make sure that red **No** changes to a green **Yes**.

3. Click the **Data** tab on the menu bar. The **Data** window appears.

4. Use the **Incubation Time** drop-down list to select the number of hours the MicroPlate has incubated.

5. Place the correct MicroPlate in the reader.

6. To work from an open worksheet:

   - Click **Select Read** to go to the selected worksheet.
   - Click on the sample number you want to read. An arrow will appear next to the sample you select.
   - Click **OK**. The reader calibrates itself, pulls the MicroPlate inside, takes a reading, displays the result on the **Data** window, and ejects the MicroPlate.
   - If necessary, click **Cancel** to return to the worksheet.

7. To read plates sequentially:

- Click **Read Next** to sequentially read the next MicroPlate on the worksheet without returning to the Worksheet window.

- A **Confirmation** window appears. Click **OK** if it displays the MicroPlate you want to read. The reader calibrates itself, pulls the MicroPlate inside, takes a reading, displays the result on the **Data** window, and ejects the MicroPlate.

- If necessary, click **Cancel** to return to the **Data** window.

8. Click **Print** to print the report (if you did not select Automatic Printout).

9. Click **Save** to save data (if you did not select Auto Write to Data file.) A **Confirmation** window appears.

10. Repeat Steps 5-9 for all MicroPlates.

Adjusting Thresholds Manually

The software allows you to view histograms of MicroPlate patterns. In most cases, use of this feature should not be necessary to obtain accurate results. However, this advanced technique can be useful if you feel that the automatic reading of your MicroPlate does not match your visual interpretation. You can adjust either or both of the thresholds to override the automatic reading and obtain what you feel is the correct result. You can only adjust thresholds in Reader mode and for only GN, GP and AN plates

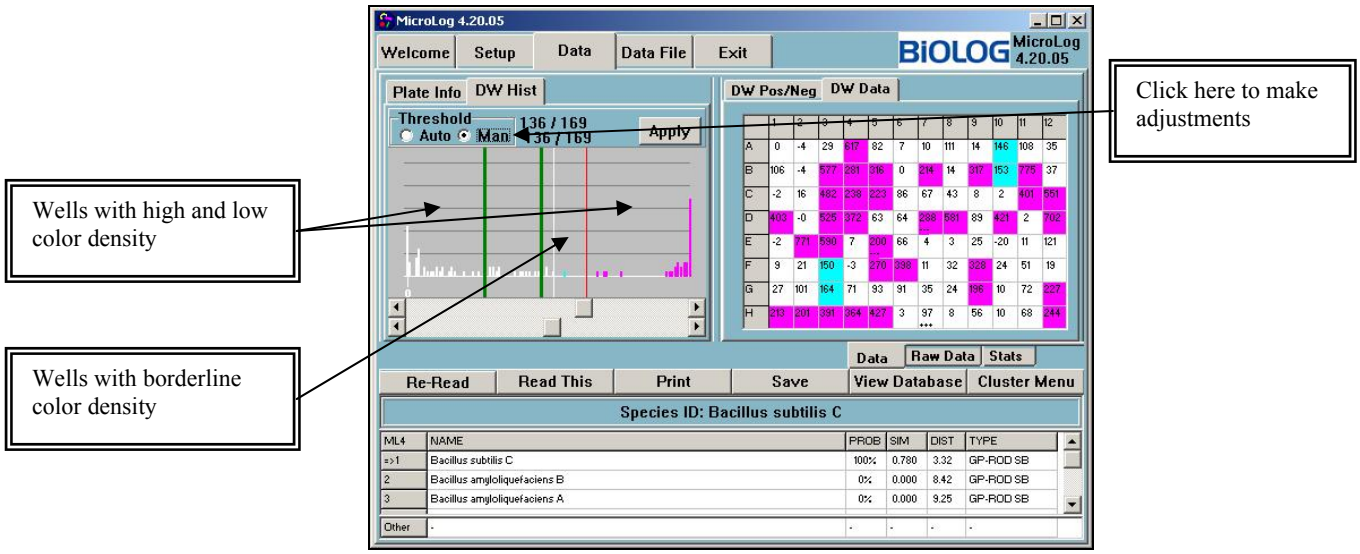
Caution!

Manually adjusting thresholds will change SIM and DIST values. These changes override automatic thresholds. This is an advanced technique. Call Biolog Technical Service if you need help.

1. Click on the small **DW Data** tab at the upper right edge of your on-screen Microplate (on the **Data** window). You'll see an on-screen MicroPlate of your sample, showing optical densities.

2. Click the **DW Histogram** tab. A histogram of the current ID selection appears.

3. The histogram is divided into three lateral sections, which represent color distribution within the MicroPlate. Wells with low and high color density are on the left and right sides of the histogram. The middle section (between the two vertical lines) represents wells with borderline reactions.



HISTOGRAM (ON LEFT) AND OPTICAL DENSITIES (ON RIGHT)

4. Click the **Manual** radio button to make adjustments.

5. Use the horizontal scroll bars under the histogram to make adjustments to the thresholds. The top scroll bar adjusts the negative threshold (white line); the bottom scroll bar adjusts the positive threshold (red line). Green lines represent the automatic threshold levels.

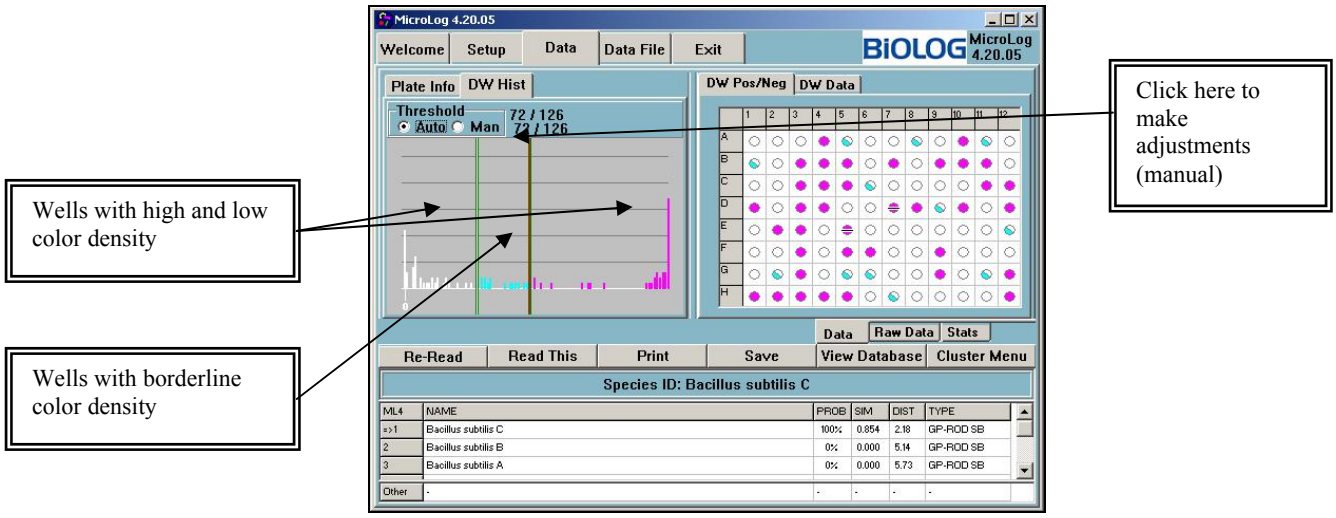
6. Continue until you feel the adjusted threshold corresponds to your visual read of the MicroPlate.

7. Click **Apply** button to update thresholds.

Note: FF MicroPlate types will have Pos/Neg, Data, and Histogram tabs for both color and turbidity.

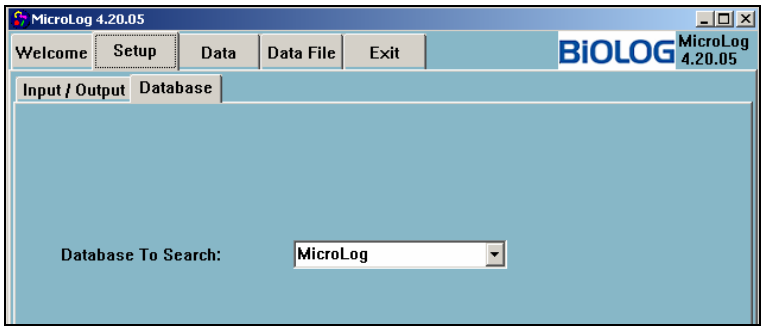
Choosing a Database to Search

The software allows you to select which database you want to search. If you have created User (custom) databases you can search the MicroLog databases, the User database or both. For information on creating a User database, see Section 7. MicroLog databases may not be selected as a User database.



HISTOGRAM (ON LEFT)

1. Click the **Database** tab on the **Set Up** window. The **Database** window appears.



DATABASE WINDOW (TO SELECT DATABASE TO SEARCH)

You'll see a Data Management Menu bar on the Database window. See Section 7 for data management instructions.

2. Use the drop-down list to select the database you want. If you select a User or MicroLog/User database, the **User Progressive Database** and **User End-Point Database** (YT & FF) fields appear. Click on the appropriate field and a **Database File** dialog box appears.

3. Select the desired database by choosing the file name. For End-Point databases, the file name will include the hour (e.g., for a 24 hour read, select "demo24.eid").

4. Click **OK**.

Note: When you're conducting a MicroLog/User database search, a "U" will appear on the Species ID ranked list on the Data window to denote species in the User database. Also, you will see a ML/user designation in the upper left corner of the organism choices.

Exiting

When you're finished, click the **Exit** tab on the menu bar. Click **Click Here to Exit**.

Note: If you change your mind after clicking the **Exit** menu tab, you can go back to your work by clicking any tab on the menu bar.

6. Interpreting Results

In this section:

Check the bottom section of the **Data** window. The software identifies your microbe in the form of a ranked list. Entry #1 is the best match selected from the database. The other identifications are ranked in descending order of pattern match. Scroll down to see the whole list.

SPECIES ID : CITROBACTER FARMERI

	NAME	PROB	SIM	DIST	TYPE
=>1	CITROBACTER FARMERI	100%	1.000	0.00	GN-ENT
2	CITROBACTER AMALONATICUS	0%	0.000	5.26	GN-ENT
3	CITROBACTER FREUNDII	0%	0.000	6.54	GN-ENT
Other	-	-	-	-	-

CLOSE-UP OF RESULTS SECTION OF DATA WINDOW

The ID box

Final identification results are displayed in the ID box at the top of the results area of the **Data** window. The software considers the possibility that even the #1 ranked species may not be a good enough match. In this case, you will see "No ID" in the ID box.

Reading Printouts

Every time you read a MicroPlate, the printer will issue a hard copy report. The information on these reports varies, depending on whether you are working in manual or reader mode. See Appendices for plate data statistics (A-1), and sample printouts and explanation of entries (A-5).

Assessing the Accuracy of Your ID

If the answer to the following three questions is yes, you can feel confident that ID #1 is accurate.

- Are the top-ranked ID choices on the list all the same (or closely related) genera?
- Check the SIM (similarity index value) rating of ID #1. Is it greater that .5?
- Check the DIST (distance) rating of ID #1. Is it greater than two distance points away from the 2nd choice.

Pinning Down an Uncertain ID

Understanding the language of microbe identification:

% PROB – allows you to compare our IDs to other systems that use this type of calculation
SIM – tells you how good each match is
DIST – tells you the number of mismatches between your MicroPlate results and the database pattern for that species

If the top-rated choices show any of the following results, you may want to do some additional probing:

- The top-rated ID choices on the list are random and unrelated genera
- For GN, GP, & AN database (24 hour results):
  - SIM is very near 0.5
  - DIST is greater than 5.0
  - DIST of the first and second choices are nearly equal (less than two distance points apart)
  - There are many variable reactions (more than 15)
- For YT database (≥48 hour results):
  - SIM is near 0.5
  - DIST is greater than 5.0
  - DIST of the first and second choices are nearly equal
  - There are many variable reactions (more than 15)
- For FF database (all time points):
  - SIM is near cutoff values for each day (1-4)
  - DIST is greater than 5.0
  - DIST of the first, second and third choices are nearly equal
  - There are many variable reactions (more than 30)

Note: For FF MicroPlate identifications, verification of the culture morphology is necessary. Refer to the software database photo library or mycology textbooks as references.

For additional assistance in interpreting results, contact Biolog Technical Service.

ID Rules of Thumb:
SIM = 1.0 → a perfect match
SIM = 0.0 → no match
The closer to 1.0, the better the match.

1. The chart below will help you clarify your identification by using SIM and DIST values:

USING SIM AND DIST TO ASSESS IDENTIFICATIONS

Assess SIM for ID #1

Gram-negative aerobes Gram-positive aerobes	➔ must be ≥ 0.5 at 16-24 hours incubation ➔ must be ≥ 0.75 at 4-6 hours incubation
Anaerobic microbes	➔ must be ≥ 0.5 at 20-24 hours incubation
Yeasts	➔ must be ≥ 0.75 at 24 hours incubation ➔ must be ≥ 0.5 at 48 or 72 hours incubation
Filamentous Fungi (& select yeasts)	➔ must be ≥ 0.90 at 24 hours incubation ➔ must be ≥ 0.70 at 48 hours incubation ➔ must be ≥ 0.65 at 72 hours incubation ➔ must be ≥ 0.60 at 96 hours incubation

Assess SIM for top IDs

If SIMs for top IDs are < the SIM required **AND** all belong to the same genus **AND** if their total is ≥ the SIM required, you can be confident that the microbe is in that genus. MicroLog will give you a genus-level ID rather than a species-level ID.

Assess DIST for top IDs

If SIM is OK, but DIST between ID#1 and ID#2 are very close	➔ Good match to both species (some are quite close)
If you remain unconfident of the ID, try to differentiate organisms by	➔ Gram stain, colony morphology, oxidase and/or catalase tests, additional tests (see *Bergey's Manual*)

What Should I Do About "No Identification"?

Check the on-screen + and – signs for that MicroPlate. You can use these mismatch indicators to assess what happened.

2. If you get a "No Identification" result, the % Prob value will not be displayed. When this happens, check for black + and – signs in the on-screen MicroPlate.

   - If there are both + and – random mismatches, this is probably a true mismatch. If so, this is probably a species not in Biolog's database. You can add it to your own user-created database. See Section 8.
   - If the mismatches are all + or all –, you may have made a testing error. Refer to Table 6-1, and see Section ***10***.

Table 6-1 will assist you in figuring out the cause of these mismatches:

Mismatch Type	What It Might Mean
All + (your pattern is giving fewer positive reactions than the species you're comparing it to)	Under-inoculation
	A1 well is overfilled, contains clumps, or is cloudy
	Cells were mishandled, too old, cultured on wrong medium, suspended in wrong inoculating fluid, incubated at wrong temperature, etc.
All – (your pattern is giving more positive reactions than the species you're comparing it to)	Over-inoculation (especially with enterics)
	A1 well is underfilled
	Contamination (mixed culture)

TABLE 6-1. ASSESSING MISMATCHES

FF database

Perform a visual macroscopic and microscopic assessment of your isolate compared to the first three ID ranked species. Refer to MicroLog software photo library or mycology textbooks as references.

Note: The A1 well is not used as a negative control in the FF database, therefore this well may not appear colorless.

FF ID Workflow

1. Read daily (at 24, 48, 72 hours) until ID is called.
2. After an ID is called, verify the first three choice macro/microscopically
3. If no ID, re-incubate the MicroPlate
4. Read at 96 hours. If an ID is called, verify the first three choices macro/microscopically
5. If no ID, launch additional investigation. Check first three choices macro/microscopically.

When you're interpreting results:

1. Trust your eye over the reader.
2. When in doubt, repeat the test, using stringent technique.

GN, GP, and AN databases

1. Perform a visual assessment by checking the A1 well.
   - If it contains a significant purple color, this color may be obscuring the pattern. Re-examine your general setup procedures.
   - The strain may need to be retested with thioglycolate added to the inoculating fluid.
   - With some rare gram positive species, salicylate must be added (in addition to thioglycolate) to eliminate the false positive purple color.
2. Check for borderline reactions. The system essentially disregards these when making identifications.
   - Review and verify your testing procedures. Did you use all optimal conditions?
   - If there are more than 15 borderline reactions, visually check the MicroPlate. If you used the reader, compare how it read the pattern in relation to how you read it by eye. If you disagree with the reader, click the **Set Up** tab on the menu bar. Select **Manual** mode and correct reactions manually. Or you can use the histogram function to adjust the thresholds (see Section 5). Re-identify based on the modified pattern or incubate the MicroPlate for a longer time (do not exceed time limits).
3. Check for a message in the ID box. When appropriate, the ID box will offer additional information to guide your identification. For example:
   - ID of *Salmonella*, *Shigella*, or *E. coli* O157, ID box message says "Confirm by Serology"
   - ID of *Listeria* species or *Neisseria gonorrhoeae*, ID box message says "Confirmation of ID is recommended."

Species Comparison

MicroLog software has several features that can help with species identification. You can compare any pattern with the expected pattern of any species or taxa in the database. You can also display expected species patterns visually.

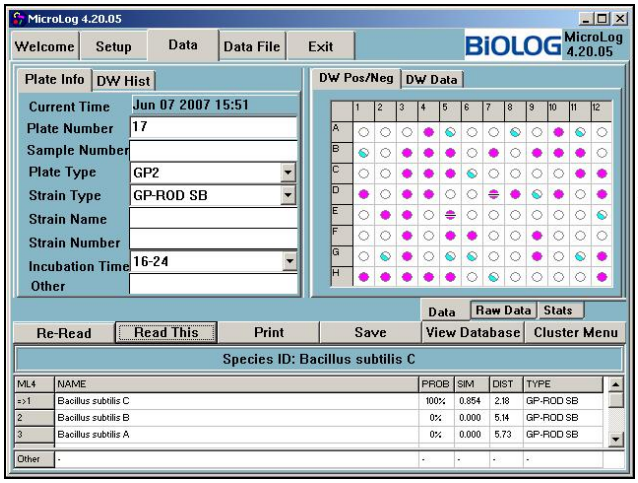
To compare your #1 ID with others on the list of runners-up:

What are those + and – signs?

These are signs showing mismatches between your sample and the database record.
+ ≥ 80% pos
– ≤ 20% pos

1. After a pattern is entered, the on-screen MicroPlate automatically displays the major mismatches between the #1 ranked species and your MicroPlate.

2. To compare your ID with other species on the list, click on the species you want to view. A small arrow appears next to the selected organism and the major mismatches are displayed.



Mismatches displayed

PLUS (+) AND MINUS (–) MISMATCHES

3. To compare against a species that is not in the 10 top-ranking, click on the **Other** row. See page ***13***

Searching and Assessing Species Information

MicroLog software gives you an opportunity to find out more about the range of reaction patterns of species in the MicroLog database (or any record in a user database). There are three possible ways to access the species information feature, all from the **Data** window:

- Using the View Database button on the selection bar.
- Using the ID box
- Using the "Other" row

Using the View Database Button

You can get advanced species information without running identification, for single or multiple records in any database.

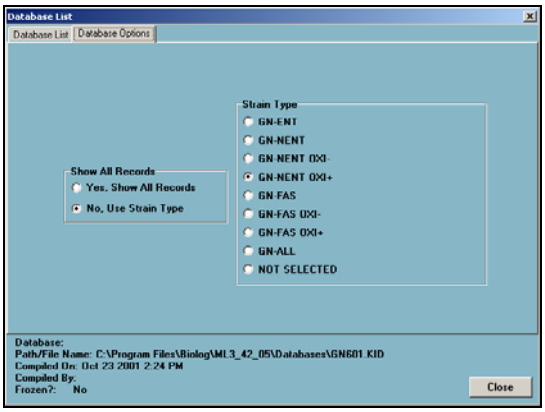
1. Click the **View Database** selection bar on the **Data** window. The **Database List** appears. This is a species list from the database, based on the strain type you last selected on the Data window.

2. Click the **Database Options** tab to select the database you want to view, based on strain type.

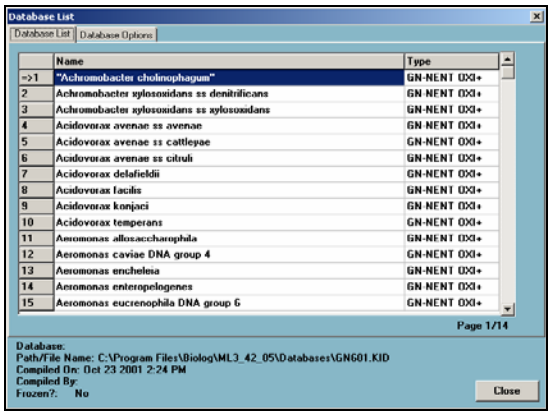
3. The **Database List** contains 15 records per page. Click **Page Up** or **Page Down** or use the scroll bar to move through the list.

4. Click on the row containing the species you want.

5. This will take you to the **End-Point** and **Progressive** data pages.



DATABASE OPTIONS WINDOW



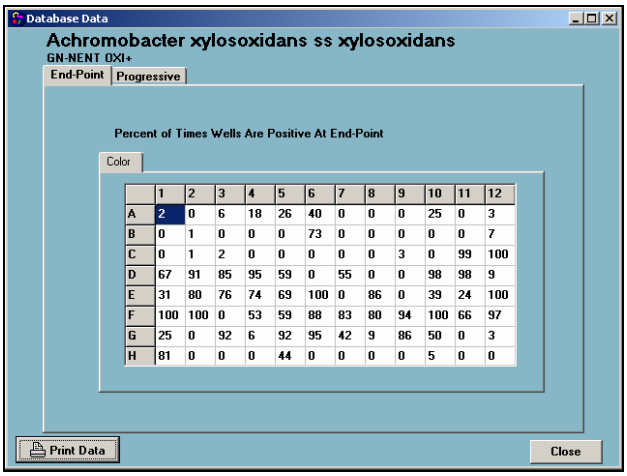
DATABASE LIST WINDOW

Endpoint data analysis

For each well, the number displayed represents the percentage of strains of the displayed species that were positive at the selected incubation time.

1. In the ID box in the **Data** window, right-click on the species you want to investigate. The **End-Point** window in the **Database Data** window appears.

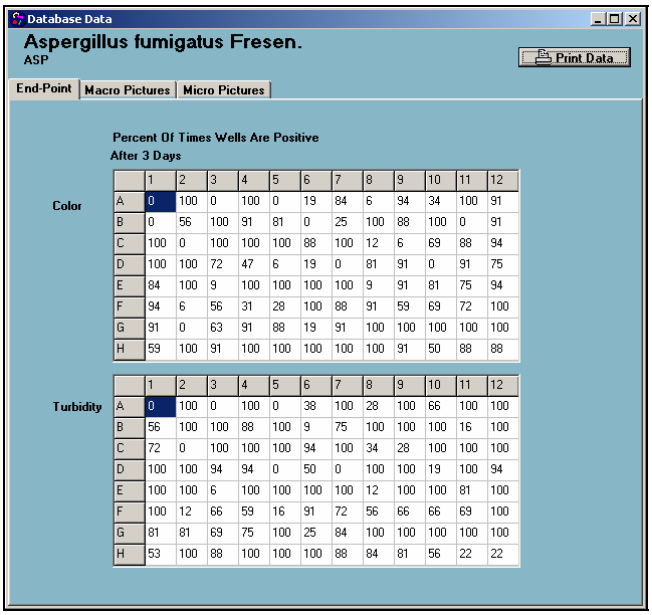
NOTE: A1 value may be greater than 0 if the organism tends to give false positive reactions.



	1	2	3	4	5	6	7	8	9	10	11	12
A	2	0	6	18	26	40	0	0	0	25	0	3
B	0	1	0	0	0	73	0	0	0	0	0	7
C	0	1	2	0	0	0	0	0	3	0	99	100
D	67	91	85	95	59	0	55	0	0	98	98	9
E	31	80	76	74	69	100	0	86	0	39	24	100
F	100	100	0	53	59	88	83	80	94	100	66	97
G	25	0	92	6	92	95	42	9	86	50	0	3
H	81	0	0	0	44	0	0	0	0	5	0	0

DATABASE DATA WINDOWS (END-POINT WINDOW)

YT & FF MicroPlates are limited to endpoint data analysis only



	1	2	3	4	5	6	7	8	9	10	11	12
A	0	100	0	100	0	19	84	6	94	34	100	91
B	0	56	100	91	81	0	25	100	88	100	0	91
C	100	0	100	100	100	88	100	12	6	69	88	94
D	100	100	72	47	6	19	0	81	91	0	91	75
E	84	100	9	100	100	100	100	9	91	81	75	94
F	94	6	56	31	28	100	88	91	59	69	72	100
G	91	0	63	91	88	19	91	100	100	100	100	100
H	59	100	91	100	100	100	100	100	91	50	88	88

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	100	0	100	0	38	100	28	100	66	100	100
B	56	100	100	88	100	9	75	100	100	100	16	100
C	72	0	100	100	100	94	100	34	28	100	100	100
D	100	100	94	94	0	50	0	100	100	19	100	94
E	100	100	6	100	100	100	100	12	100	100	81	100
F	100	12	66	59	16	91	72	56	66	66	69	100
G	81	81	69	75	100	25	84	100	100	100	100	100
H	53	100	88	100	100	100	88	84	81	56	22	22

2. The numbers appearing in the on-screen MicroPlate show (for each well) the average "percent positive" value, considering all strains of the species that were tested. This is a simple way to view species data.

Progressive data analysis applies to bacterial identifications only

3. Click the **Progressive** tab to view more sophisticated bacterial species data, namely, the range of reactions you can get for this species as the pattern develops in a progressive fashion.

On all progressive data windows:

Click on a specific well to select it. Find well information in "Key" box. Click "Set to Current Data Value" to return all settings to number of positive reactions your current MicroPlate has.

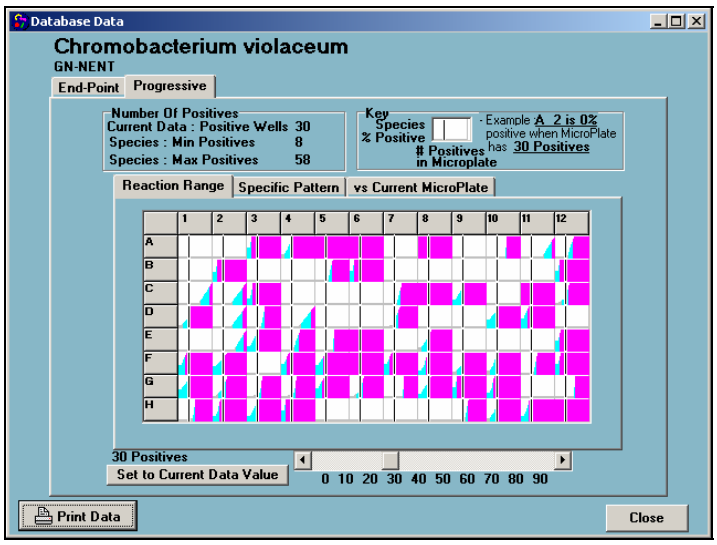
Progressive data analysis

MicroLog software uses a new method of pattern matching called Progressive ID (PID). The PID method takes into account the progressive nature by which purple color forms in the wells of the MicroPlate. What typically happens after cells are inoculated is that some wells turn purple quickly and strongly, resulting in dark purple wells. These are usually the preferred carbon source for the microbe. After additional incubation, other wells also turn purple, sometimes forming weaker purple wells.

For example, if a MicroPlate has 23 purple wells, PID will compare the pattern to the other species in the database *at their stage of development when they also had 23 purple wells*. Each species in the database responds to the search, as if to say "This is my pattern when I had 23 positive reactions." PID finds the best match among the species in the database. The mathematics of matching the species to the pattern is otherwise identical to that used in the previous method of End-point ID (EID).

Reaction range

This display shows the entire metabolic progression of the species in a single image. The boxes are entirely purple when the well is positive 100% of the time. A teal color indicates that the well is positive from 20% to 80% of the time. Empty boxes indicate that the substrate is used < 20% of the time. Each box contains a black line that shows how many positive reactions are on the given MicroPlate. This black line is a gauge of progressive identification. The top right corner of the window contains a key showing the current reaction of a specific well and how often it is positive.



REACTION RANGE WINDOW

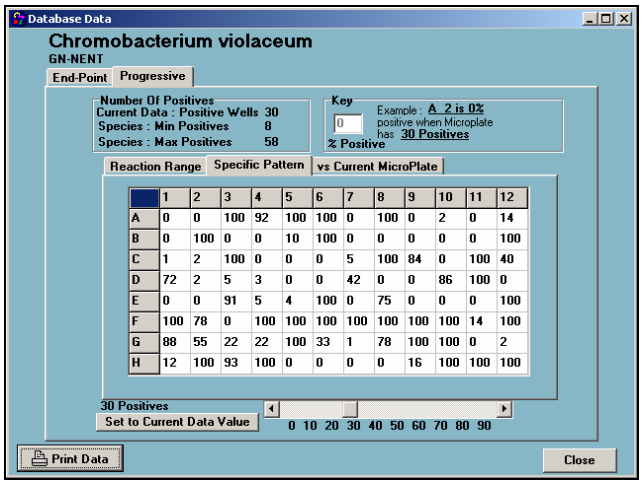
Slide the scroll bar left and right to represent various levels of positive reactions. As the vertical line moves across each well of the on-screen MicroPlate, it indicates where in the histogram a chosen positive well value falls.

- The purple area under the graph (histograms) represents when a well is positive for that species.
- A box that is completely purple is always positive for that species. This is a preferred carbon source for that species.
- A box that has limited levels of purple is only positive when there are relatively high numbers of positive wells on the MicroPlate.
- Teal represents borderline well reactions.
- You can click on any well and it will appear as the example shown on the key at the top.

Specific pattern

This display shows the numerical pattern for the species at a specific level of positive reactions. This is a more explicit display of the **Reaction Range** display. For the number of positive reactions (indicated below the display and adjusted by using the scroll bar), this is the percentage of times that a specific well is positive.

- A well that is 100 when the scroll bar is far to the left is a well that is always positive for that species, even when it has few positive reactions.
- A well that is only 100 when the scroll bar is to the far right is a well that is only positive when the species has many positive reactions.
- A well that contains a low number or zero is a well that is rarely or never positive, even when the species has expressed its full metabolic potential.



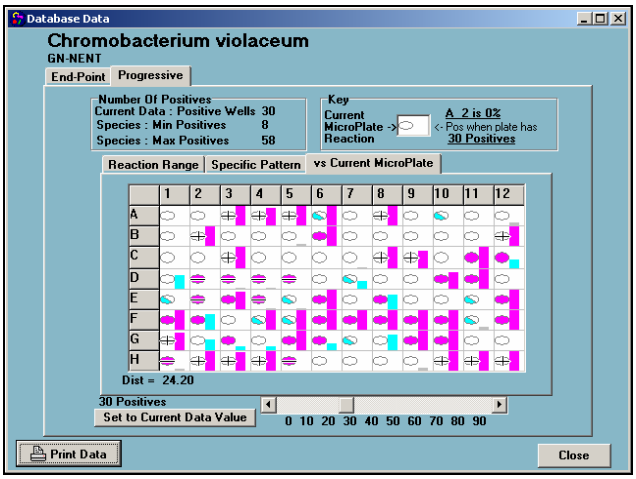
	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	100	92	100	100	0	100	0	2	0	14
B	0	100	0	0	10	100	0	0	0	0	0	100
C	1	2	100	0	0	0	5	100	84	0	100	40
D	72	2	5	3	0	0	42	0	0	86	100	0
E	0	0	91	5	4	100	0	75	0	0	0	100
F	100	78	0	100	100	100	100	100	100	100	14	100
G	88	55	22	22	100	33	1	78	100	100	0	2
H	12	100	93	100	0	0	0	0	16	100	100	100

SPECIFIC PATTERN WINDOW

Vs. current MicroPlate

This display shows a graphical representation of the pattern for the species at a specific level of positive reactions versus the MicroPlate currently on the **Data** window. The circle at the left of each box represents the reactions in the current MicroPlate. The bar at the right of each box represents the percent of times the species is positive at the given level of positive reactions.

- Slide the scroll bar left and right to see the animation of the metabolic progression for that species.
- Purple indicates positive wells.
- Teal represents borderline well reactions.
- Empty boxes are always negative.
- The display shows major mismatches between the current MicroPlate and the species, at the current level of positive reactions.
- If you set the number of positive reactions to be equal to the number of positive reactions in the current MicroPlate, you can see how the ID search treats the match between your MicroPlate and the displayed species.



VS. CURRENT MICROPLATE WINDOW

Using Macroscopic and Microscopic Pictures

You can access macroscopic and microscopic species of selected fungi in the MicroLog photo library of the FF database.

1. From the **Data** window, click the **View Database** selection bar. The **Database List** appears. This is a species list from the database based on strain type last selected on the Data screen.

2. Click the **Database Options** tab and select the database you want to view, based on strain type.

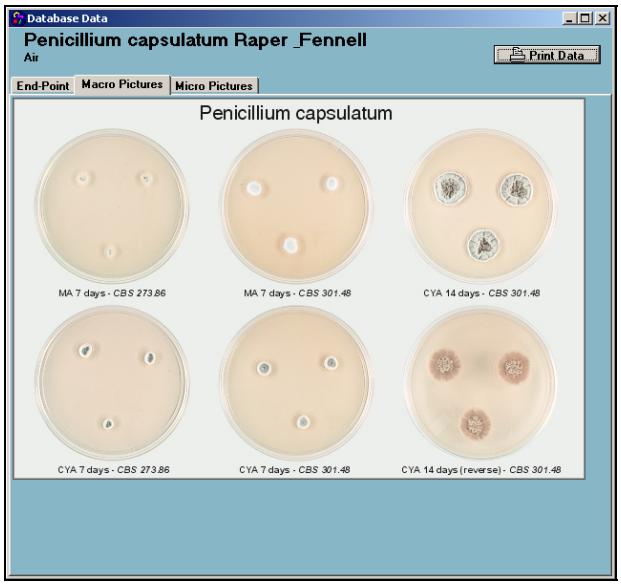
3. Click back to the **Database List**. Click **Page Up** or **Page Down** or use the scroll bar to move through the list.

4. Click on the row containing the species you want.

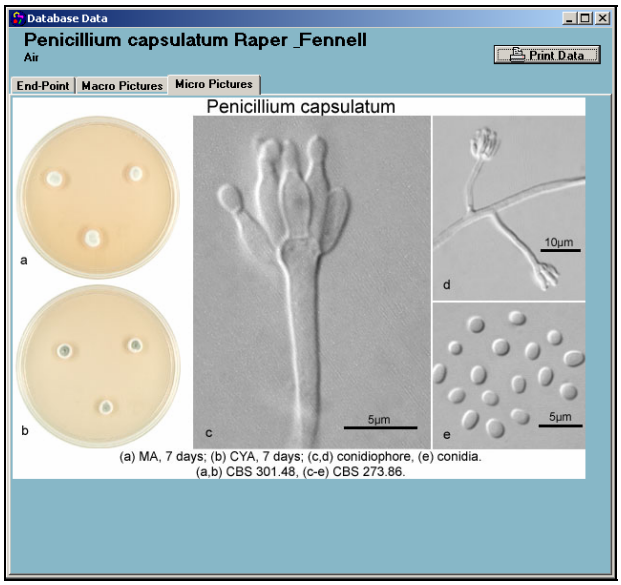
5. The **End-Point**, **Micro Pictures**, and **Macro Pictures** tabs appear.

6. Click on the **Macro** or **Micro** tab to access the photo library.

MACRO AND MICRO TABS ON DATABASE DATA WINDOW



MACROSCOPIC PICTURE



MICROSCOPIC PICTURE

Using the Other Row

You can use the **Other** row at the bottom of the **Data** window to get additional species information.

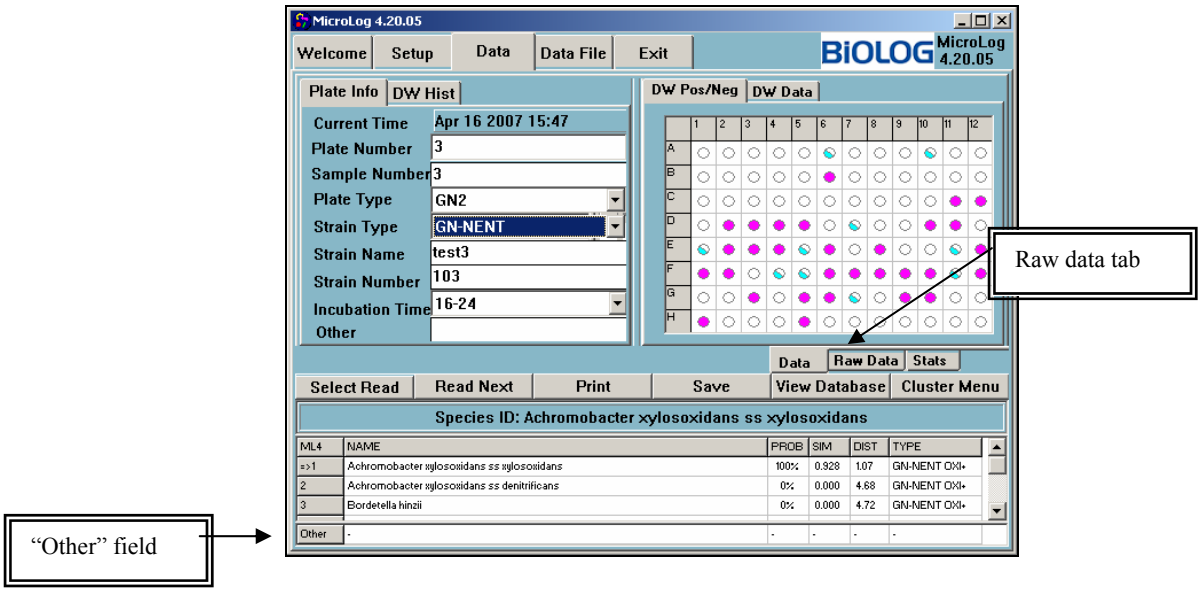
1. Double-click anywhere on the **Other** row at the bottom of the ID box (watch for the small arrow).

2. The **Database List** appears. Click on the row containing the species you want to highlight it.

3. Click OK to return to the **Data** window. Note that your selection now appears in the **Other** row. In addition, positive (+) and negative (–) mismatches appear in the on-screen MicroPlate, as does the DIST value in the ID box. This performs a comparison between the database record and your MicroPlate ID.

Note: If you are searching both the MicroLog and User databases, the program will request that you designate which database you wish to compare to before the Database List appears.

4. Click on the **Other** row and press Enter or Backspace on your keyboard to clear the entry.



DATA WINDOW WITH "OTHER :FIELD FILLED (NOTE DIST AND +/– ENTRIES)

Accessing Raw OD Values

This function allows you to access the raw OD values for the wavelengths read.

1. Click the **Raw Data** tab on the **Data** window. This tab is located below the reaction section of the **Data** window. The raw OD values for the wavelengths read will be displayed.

2. To return to the previous data view, click the **Data** tab.

Accessing Data Values

This function allows you to access the Data values for the wavelengths read. This is useful to view both sets of data values for the FF results on one screen.

1. Click the **Data Stats** tab on the **Data** window. This tab is located below the reaction section of the **Data** window. The Data values for the wavelengths read will be displayed.

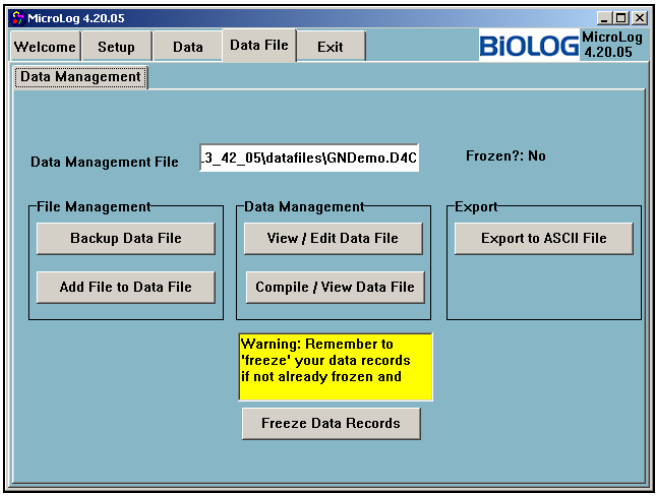
2. To return to the previous data view, click the **Data** tab.

7. Data Management and Compiling Databases

In this section:
- **➔BackUp a Data File**
- **➔Combining Data Files**
- **➔Viewing and Editing Files**
- **➔Compiling Data Files**
- **➔Exporting ASCII Data**
- **➔Cluster Analysis**

The heart of the software is a library of over 1,900 microbes, distributed over a number of organism databases. You can replace or augment this library with other species or strains. The user can compile an ID File (customized database) from a Data File and perform identifications using either our database or your own customized database. The software also provides functionality for managing Data Files, which is also useful in preparing a Data File for compilation. These functions include backup (copying), combining, editing, printing, exporting to other applications (such as Microsoft Excel® or Microsoft Access™).

The software also provides dendrograms and Multi-Dimensional Scaling diagrams, useful for cluster analysis.



DATA FILE DATA MANAGEMENT MENU PAGE

Data File Management under Restricted Access mode

If the software is running under Unrestricted Access mode, then any user may access the Data File Management page. Under Restricted Access mode, only users with at least the View/Print privileges may have access. If a user with the Log-In and Set Up privileges only, then a warning message box pops up stating that the user: "Must have the View/Print privilege to navigate to the Data File Management page".

Users with the View/Print privilege may access the following features:

- Backup Data File

- View and Print functions (from the **View/Edit Data File** button)
- Export to ASCII File

Users with Edit Data File privileges have access to advanced features, including:

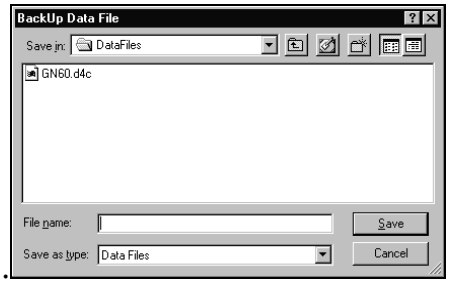
- Add File to Data
- Editing functions (from the **View/Edit Data File** button)
- Compile/View Data File

Backup Data File (Copying a Data File)

Before altering a Data File in any way, it is good practice to make a back-up copy of the Data File. Frozen files cannot be edited; therefore, a backup copy must be created on which to perform any editing. The backup copy of the Data file keeps track of the file from which a record was copied (parent file). This creates an electronic trail of the record.

If desired, view the destination /edited file using the View/Edit feature to confirm data file modifications.

1. Click the **Data File** tab on the menu bar to view the **Data Management** page. Click on the **Data Management File** field and a **Data File** dialog box appears which lists available Data files. To select the file, click on the name of the file.
2. Click **Open**.
3. Click the **Backup Data File** button to view the BackUp Data File save dialog.
4. Enter the new desired file name (backup copy) into the **File name:** field. You can stay in the same directory as the original or navigate to another directory to save the file.



BACKUP DATA FILE SAVE DIALOG

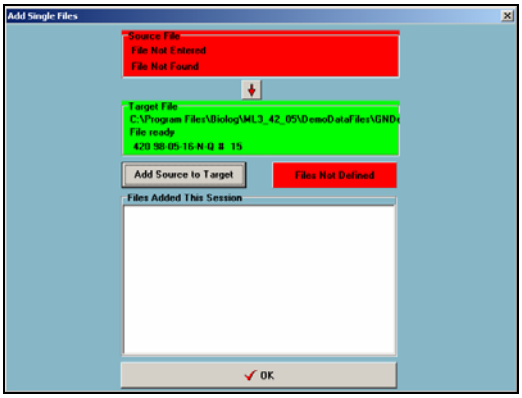
5. Click **Save**.

Combining Data Files

1. Click on the **Data Management File** field and a **Data File** dialog box appears which lists available Data files. Click on the name of a non-Frozen Data File (non-original data file or backup data file) to select that file as the destination file.

2. Click **Open**.

3. Click the **Add File to Data File** button to view the **Add Single Files** dialog. *Note: Destination file is listed in the Old File section.*



4. Click in the **Source File** section to view the **Find New Data File** open dialog.

5. Click on the desired data file name (file to add).

6. Click **Open**. *Note: Last selected file is listed in the New File section.*

7. Click the **Add Source to Target** button. The file you've added will be listed in the '**Files Added This Session**' section. The file listed in the **Target File** box now also contains a copy of the file listed in the **Source File** box. *(The **Source File** box still contains the name of the added file until another file is selected.)*

8. Follow steps 4 thru 7 to add additional files.

***Note**: As a safety feature(to avoid spurious duplication of records), the software will not allow you to add a file more than once in one session. However, if the user closes and re-opens this dialog, then the software does not prevent the user from adding a file that may have already been added.*

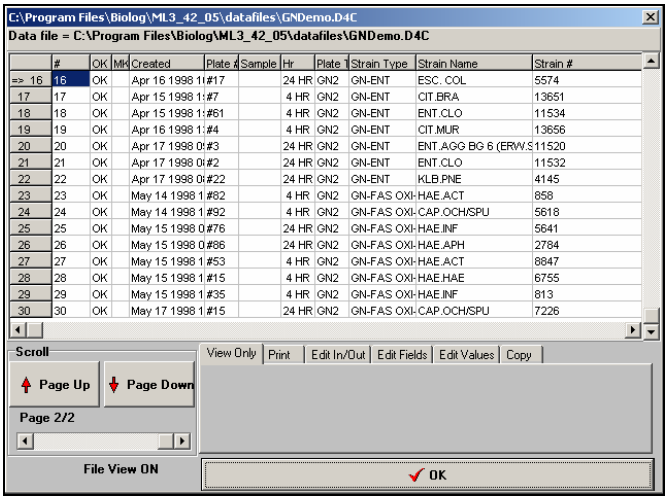
9. To freeze this file after you have added to it, click **Freeze Data Records** at the bottom of the **Data Management** window.

Viewing and Editing Data Files

1. Click on the **Data Management File** field and a **Data File** dialog box appears which lists available Data files. Click on the name of a Data File to select that file (non-original data file or backup data file).

2. Click **Open**.

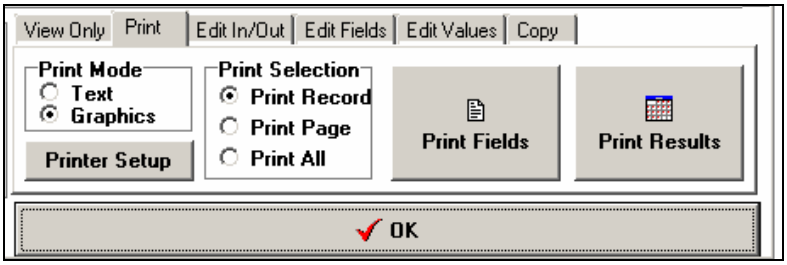
3. Click the **View/Edit Data File** button to view the **Data File Edit** dialog. *Note: Dialog contains a spreadsheet, in which each record corresponds to a read of a plate. The dialog is initially in the View Only mode.*



VIEW/EDIT DATA FILE DIALOG

4. You will be in **View Only** mode. You can examine the records, but not edit them even if the file is not frozen. *If desired, navigate to other columns or rows by using the horizontal or vertical scroll bar or adjust the column widths by carefully positioning the cursor between column headings until the cursor icon changes and, subsequently, dragging the cursor.*

5. Select the **Print** tab to access the print options.

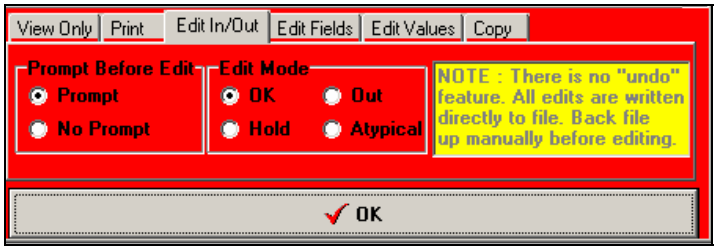


CLOSE-UP OF PRINT OPTIONS IN DATA FILE EDIT DIALOG

- Click desired radio button to select '**Text**' or '**Graphics**' as the **Print Mode**.
- Click desired radio button to select a **Print Selection** option: '**Print Record**' allows printing of the selected record, which is the record with an arrow icon in the row heading. '**Print Page**' allows printing of all the records that appear on the spreadsheet. '**Print All**' allows printing of all the records in the Data File.
- Click the **Print Fields** button to print the 'information' fields that are in the spreadsheet.
- Click the **Print Results** button to print each identification report printout.

OK, Out, Hold, Atypical
Sorting labels may be applied to individual identification records. This sorting facilitates the task of organizing records within in a datafile for the compiling user databases.

6. Select the **Edit In/Out** tab to label a record (used in the Data File compilation feature, Sec. 7 page 7). *Users without the Data File Edit privilege are prevented from accessing this page.*



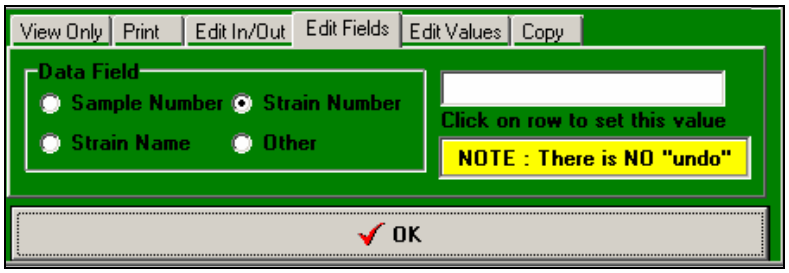
CLOSE-UP OF DATA FILE COMPILATION OPTIONS IN DATA FILE EDIT DIALOG

- Click desired radio button to select a '**Prompt Before Edit**' option. Note that the '**Prompt**' option will prompt the user for an OK button click before applying any edit.
- Click desired radio button to select an **Edit Mode** option:

OK	(to include a record in compilation)
Out	(to exclude a record from compilation, while indicating that it will never become eligible in the future)
Hold	(to exclude a record, while indicating that it may become eligible in the future)
Atypical	(to exclude a record, while indicating that it may become eligible on a contingency basis)

- Once you have selected to **Edit Mode**, click on the row to label the record in the spreadsheet. Note that the same edit may rapidly be applied to many records by clicking many records in succession.

7. Select the **Edit Fields** tab to access options that allow rapid editing of many records. *Note that users without the Data File Edit privilege are prevented from accessing this page.*



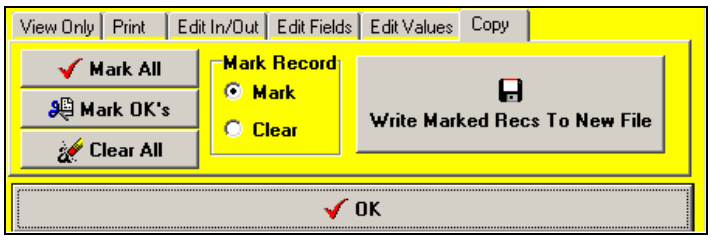
CLOSE-UP OF EDIT FIELDS OPTIONS IN DATA FILE EDIT DIALOG

- Click radio buttons to select a field for editing from among the **Data Field** options.
- Enter the value of the selected field into the Edit box.
- Once you have selected the **Data Field** and entered the value (new), click on the row on the spreadsheet to edit (replace value). *Note that the same edit may rapidly be applied to many records by clicking many records in succession.*

8. Select the **Edit Values** tab to access options that allow extensive editing of a single record. *Note that users without the Data File Edit privilege are prevented from accessing this page.*

- Click on a row in the spreadsheet to view a **Plate Information** dialog for the record corresponding to the selected row.
- Enter a value into or change a value in each Edit box, as desired. Select a different value in each Pull Down box, as desired.
- Click Save, Done or Cancel.

9. Select the **Copy** tab to access options that allow copying of selected records into another Data File. *Note that users without the Data File Edit privilege are prevented from accessing this page.*



CLOSE-UP OF COPY OPTIONS IN DATA FILE EDIT DIALOG

- Click desired radio button to select a **Mark Record** option:

Mark (to select a record for copying)
Clear (to de-select a record for copying)

- Once you have selected the **Mark Record** option, click on the row to label the record in the spreadsheet. Note that the same edit may rapidly be applied to many records by clicking many records in succession.
- To mark or clear a large numbers of records simultaneously, click one of the following-buttons:

  Mark All (to select all the records in the Data File)

  Mark OK's (to select for copying only those records that are also 'OK' for compilation)

  Clear All (to de-select all records)

- Click the **Write Marked Recs to New File** button to view the **Save Marked Data to this File** save dialog.
- Enter the desired file name of the copy into the **File name:** field. Click the **Save** button.

10. Click **Freeze Data Records** if you've finished editing the file and want to save it as a "**Read Only**" file. This will create a file that is non-editable until another backup copy is made (Backup Section 7, page 2).

Remember!

When building your own databases, strain names must be consistent when you group patterns. Using inconsistent strain names will result in incorrect database groupings.

Compiling Data Files

The software also allows you to compile data files and produce databases.

Producing databases

Be sure to save GN, GP, AN, YT, and FF MicroPlate-type readings in separate files for database compilation. Certain features of the compilation menu are specifically linked to MicroPlate type.

Choose the existing file to compile by clicking on the **Data Management File** field on the **Data Management** window. A **Data File** dialog box appears.

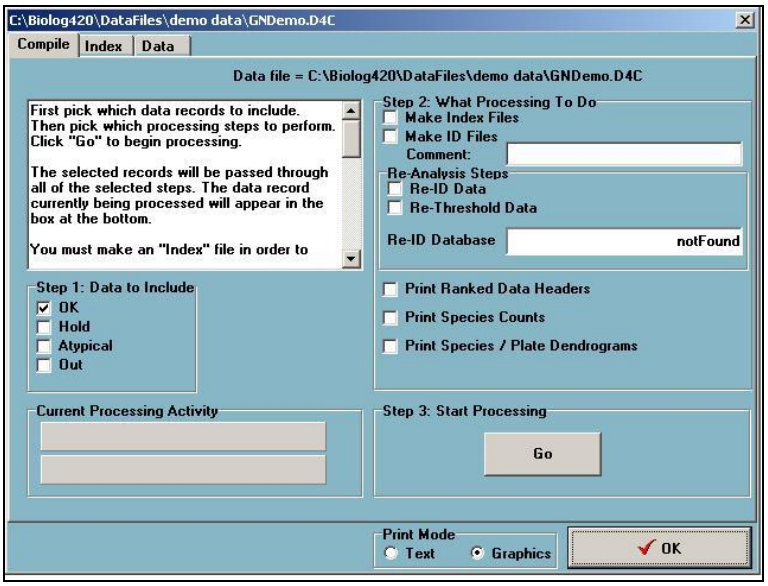
1. Click on the desired file name.
2. Click **Open**.
3. Click the **Compile/View Data File** selection bar on the **Data Management** window. The **Compile/Index/Data** tabs appear, defaulting to the **Compile** window.

4. In the **Data To Include** section, enable check marks in the desired box(es). (See pages 7.4-7.6 for the Edit In/Out process).

OK	(to include records designated OK)
Hold	(to include records designated Hold)
Atypical	(to include records designated Atypical)
Out	(to include records designated Out)

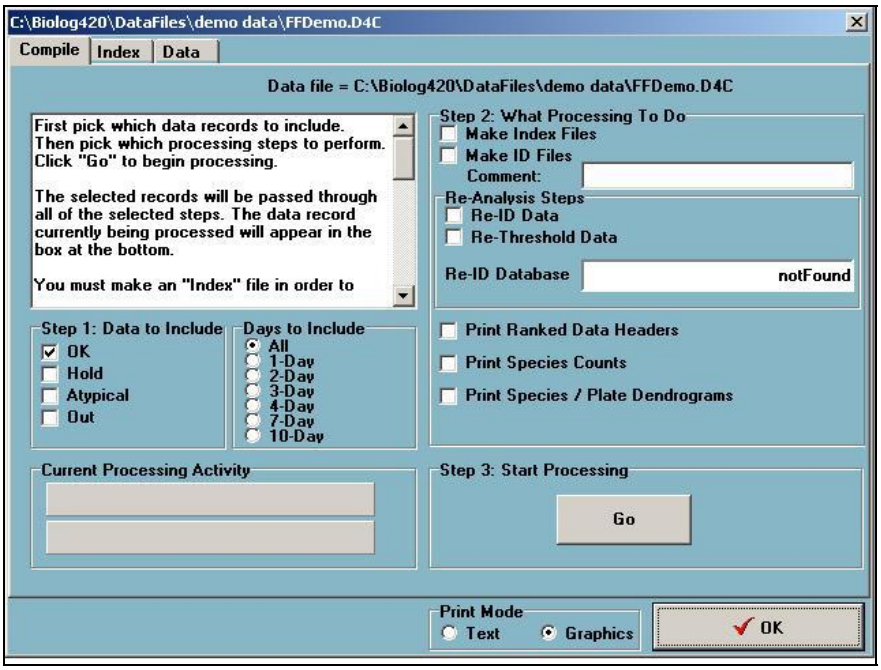
6. In the **What Processing To Do** section:

- Enable the check mark next to **Make Index Files** (this must be enabled to use the rest of this feature below).
- Enable **Make ID Files** to make your own database.
- If you are compiling files with GN, GP, or AN plate types, the window below opens.



COMPILE/INDEX/DATA WINDOWS (FOR GN/GP/AN PLATE TYPES)

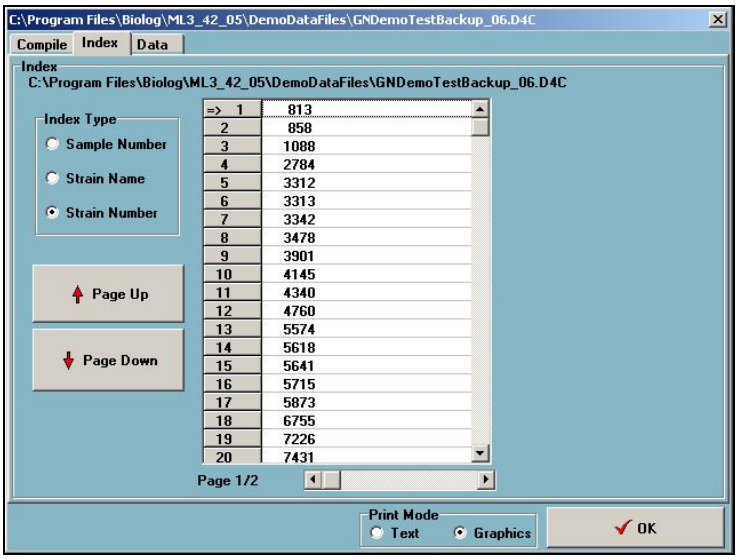
- If the file you are compiling contains YT or FF MicroPlate data, you must specify the incubation time for the data you are compiling. If the file contains several incubation times, select **All**. The software will compile the entries by strain name and automatically make an endpoint database for each incubation time. For further information, follow the on-screen instructions.



COMPILE/INDEX/DATA WINDOWS (FOR YT/FF PLATE TYPES)

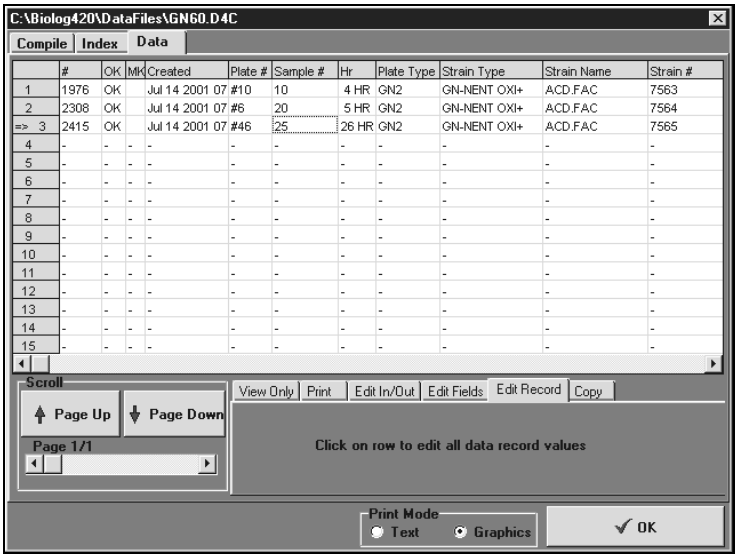
- Click **Go** to compile database.
- Indication bars at the bottom of the window show compilation progress.
- The Progressive database file will have the same name as your data file, with a ".KID" extension (GN,GP, and AN files) and the Endpoint database file, with a "EID" extension (YT and FF files). The user databases are saved as read only files.

7. Click the **Index** tab on the **Compile/View Data File** window to show the **Index** window.
   - You will be able to view a data file list by **Sample Number**, **Strain Name**, or **Strain Number**. Click the desired radio button and the list will change accordingly.
   - Click **Page Up** or **Page Down** or use the scroll bar to view the entire list.
   - To view an entry more closely, click on a row, then click the **Data** tab at the top of the page.



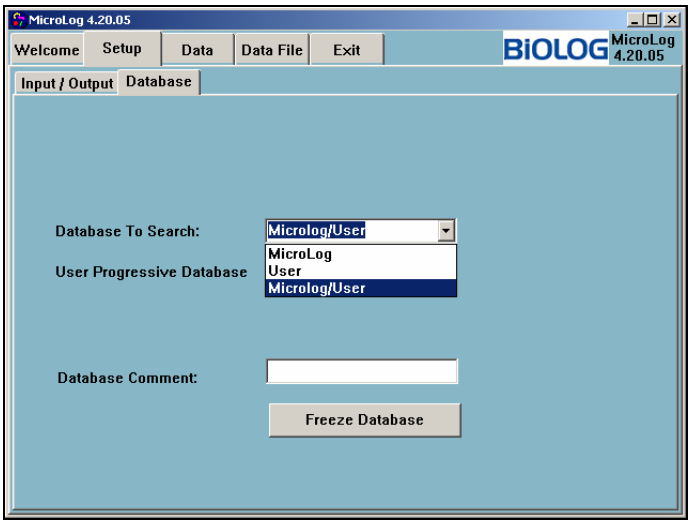
INDEX WINDOW OF COMPILE/VIEW DATABASE (WITH SAMPLE ENTRIES)

- The data spreadsheet will show you all information for that sample. You can perform all functions (such as editing and printing) from the **View/Edit Data File** menu.
- If you edit your data file after compilation, you must recompile the data before using the database to identify organisms.
- Click **OK** to close.



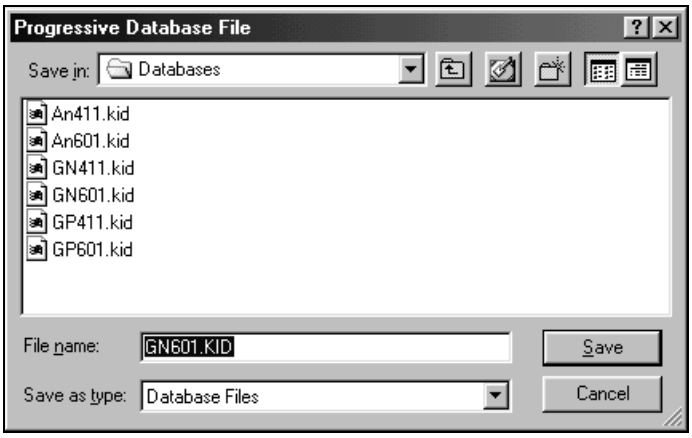
DATA WINDOW OF COMPILE/VIEW DATABASE

8. Click on the **Setup** tab to view the User Database you created.
    - Click on the **Database** tab.
    - Click on the **Database to Search** pull-down list.



DATABASE WINDOW

- Select **User**.
- If the database contains GN/GP/AN plate types, click on the **User Progressive Database** field.
- If the database contains YT/FF plate types, click on the **User End-point Database** field.
- A **Progressive** or **Endpoint Database File** dialog box appears.



DATABASE FILE DIALOG BOX

- Select the user database you want.
- Click **Save**.
- Freeze and/or comment on the database file when you finish editing.
- Click on the **Data** tab.

- Select the appropriate Plate Type, Strain Type, and Incubation time for the User Database.
- Click on the **View Database** bar under the picture of the MicroPlate.
- A list of organisms in your User Database appears similar to a MicroStation/MicroLog database list.

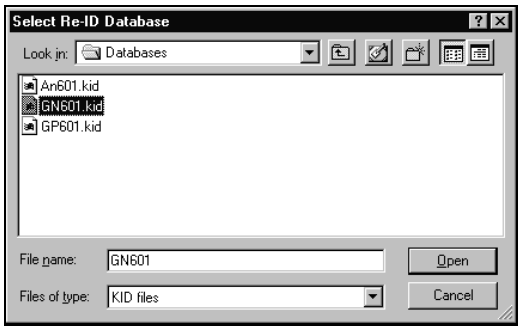
User database development

To evaluate various database versions during development, the Re-ID function allows you to perform ID test evaluations on test backup data files.

!Note: Use of the compile tab re-ID feature is not 21CFR part 11 compliant.

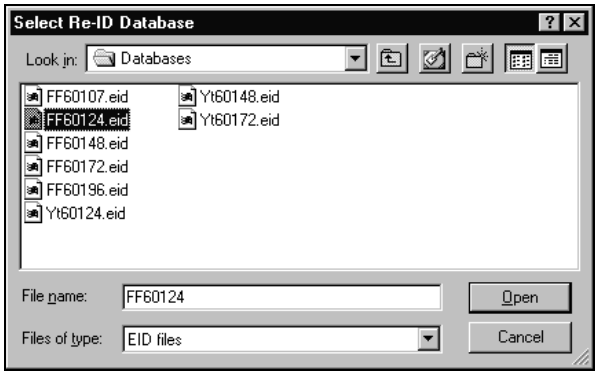
Compile tab Re-ID feature

1. Choose the existing backup file for User database development and analysis to Re-ID by clicking on the **Data Management File** field on the **Data Management** window. A **Data File** dialog box appears.
2. Click on the desired file name.
3. Click **Open**.
4. Click **Compile/View Data File.**
5. In the **What Processing To Do** section:
   - Enable the check mark next to **Make Index File** (this must be enabled to use the rest of this feature).
   - Enable **Re-ID Data** identify your data against a database you have created or re-threshold data collected in an earlier software release to the thresholds in the current release.
   - Click on the **Re-ID Database** field to select the appropriate database. The software will re-identify the data file based on this entry.
   - If the file to **Re-ID** contains GN, GP or AN MicroPlate types, the appropriate progressive database is selected.



SELECT RE-ID DATABASE WINDOW

- If the file to Re-ID contains YT or FF plate data the with only one incubation time, choose the corresponding endpoint database file for that time in the **Re-ID Database** field. For example, if the FF file is from 24-hour incubation time in Step 1, choose 1 Day. For the **Re-ID Database**, select FF60124.eid (24 Hour).



SELECT RE-ID DATABASE WINDOW

  - If the YT/FF file contains several incubation times, select **All** at Step 1. The software will compile and Re-ID the entries by strain name and incubation time. You do not need to select a database for the **Re-ID Database** field.
  - Click **Go** to Re-ID the file.
  - Indication bars at the bottom of the window shows the Re-ID progress.
  - Click **OK** when the process is finished.

Printing data headers, species counts and dendrograms

These features are automatically printed once they are compiled. The software does not save a permanent record.

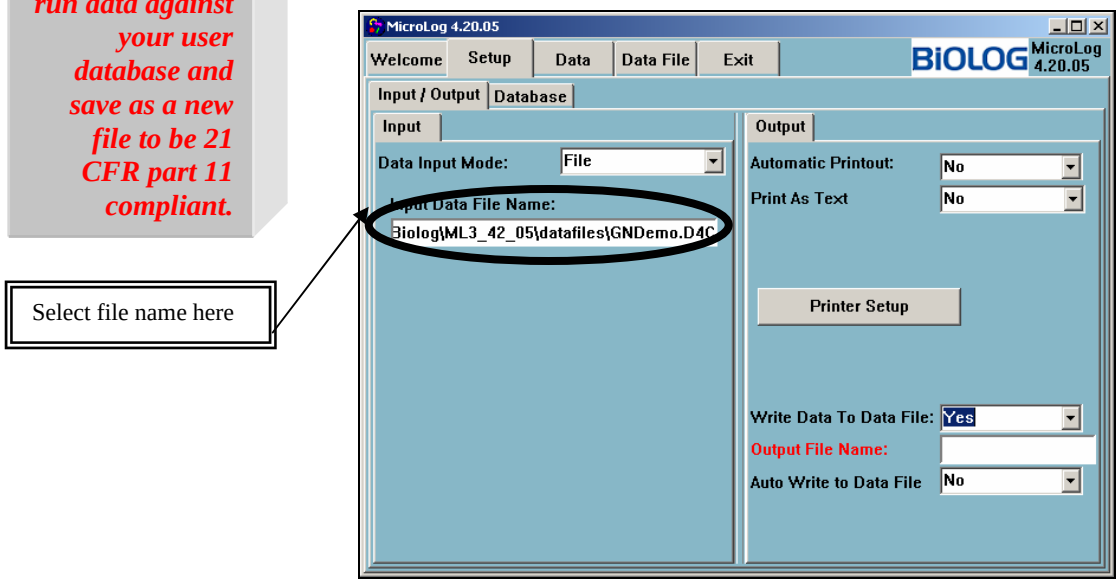
1. Choose the existing file to compile by clicking on the **Data Management File** field on the **Data Management** window. A **Data File** dialog box appears.
2. Click on the desired file name.
3. Click **Open**.
4. In the **What Processing To Do** section:
   - Enable the check mark next to **Make Index File** (this must be enabled to use the rest of this feature).

- Enable **Print Ranked Data Headers** if you want to print a list of all the information in the data file as entered in a spreadsheet row, ranked by MicroPlate type and species (see Appendices for sample printout).
- Enable **Print Species Counts** if you want to print by strain type, one row per species, with species name and number of MicroPlates for that species (this will give you a species count) (see Appendices for sample printout).
- Enable **Print Species/Plate Dendrograms** if you want to generate a dendrogram printout, with each dendrogram entry equaling one MicroPlate. The same species must have at least three entries in the file to make a dendrogram. Each dendrogram is determined by the strain name (see Appendix 5 for sample printouts). The dendrograms display linear relationships.

Entering Reactions from a Saved File for Re-ID

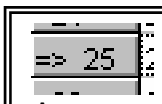
Re-ID using input mode features
You must use this method to re-ID previously run data against your user database and save as a new file to be 21 CFR part 11 compliant.

1. Use the **Data Input Mode** drop-down list to select **File** (to re-ID saved data records from a saved file)
2. The **Input Data File Name** field appears. Click in the empty field and move through the listed folders to find the file you want to read and click on it. This will bring the file name up on the **Set up** screen.

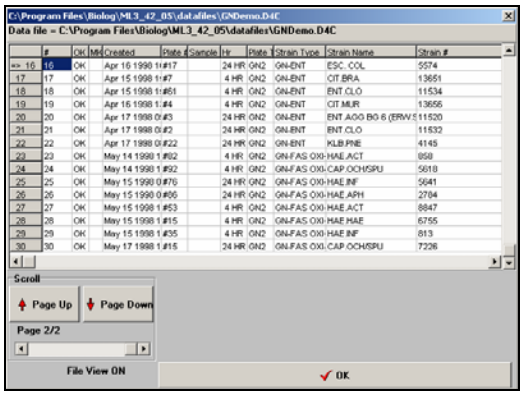


SET UP WINDOW (WITH FILE MODE SELECTED)

3. In the **Write Data to Data File** drop-down list
    a. Select **Yes** to save the generated data to another file.
    b. Click on the **Output Data File Name** field. A **Save As** dialog box appears. Enter the desired file name (D4C extension).
4. Click the **Data** tab.
5. Click **Select Read**
6. A list of saved data appears. Select the MicroPlate you want to read and click **OK**.



Arrow indicates selected entry



LIST OF SAVED DATA

7. The Data page will show the MicroLog ID record.
    a. Click the **Setup** tab.
    b. Click the **Database** tab**.**
        i. Select **User**.
        ii. Enter database file name, as required for User database search options.
8. Click the **Data** tab.
    a. The re-ID based on the MicroLog database is in view.
    b. Click the Setup tab.
    c. Select Manual input mode.
    d. Click the Data tab.
    e. Click on Re-read button
    f. Manual entry display appears with the reactions populated.
    g. Click OK to re-ID.
    h. The Data screen is displayed with the re-ID result.
    i. Click **Save** to save the ID generated for the file record entered to your Output file.

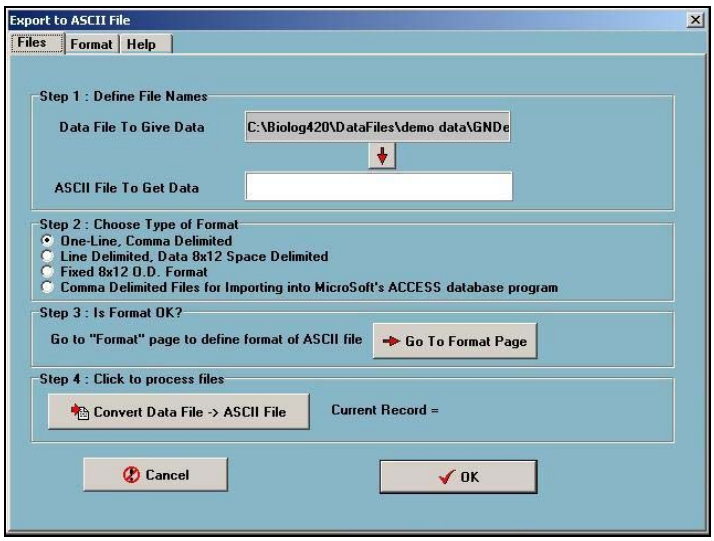
9. Click the **Setup** tab.
10. Use the **Data Input Mode** drop-down list to select **File**
11. Click the **Data** tab.
12. Click **Read Next** (to select the next record) or click **Select Read** (to choose another record) and click **OK** after the selection. *The program defaults to the MicroLog database in file input mode.*
13. Repeat steps 7 thru 12 until you have re-ID'd all of the records that you wish. Click **Save** to save the ID generated for the file record entered to your Output file.

Exporting ASCII Data

The software enables you to export data into an ASCII file, and export data to Excel and/or Microsoft Word.

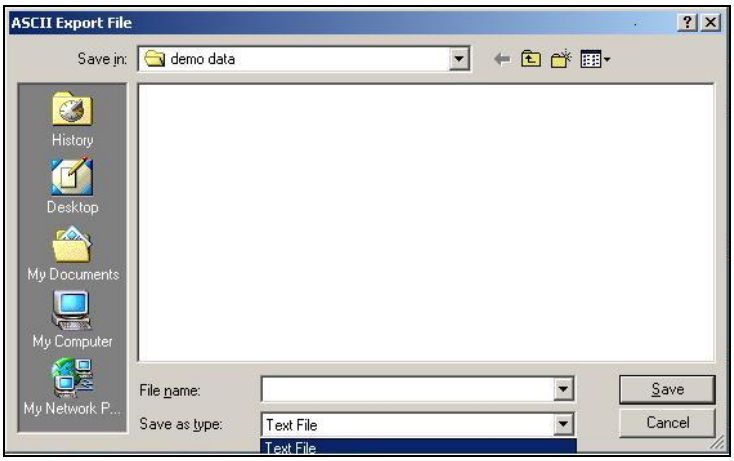
Exporting data into an ASCII file

1. Choose an existing file to export to by clicking on the **Data Management File** field on the **Data Management** window. A **Data File** dialog box appears.
2. Click on the desired file name.
3. Click **Open**.
4. Click the **Export to ASCII File** selection bar on the **Data Management** window. The **Export to ASCII File** window appears. The file you chose appears in the **Data File To Give Data** field.



ASCII EXPORT WINDOW

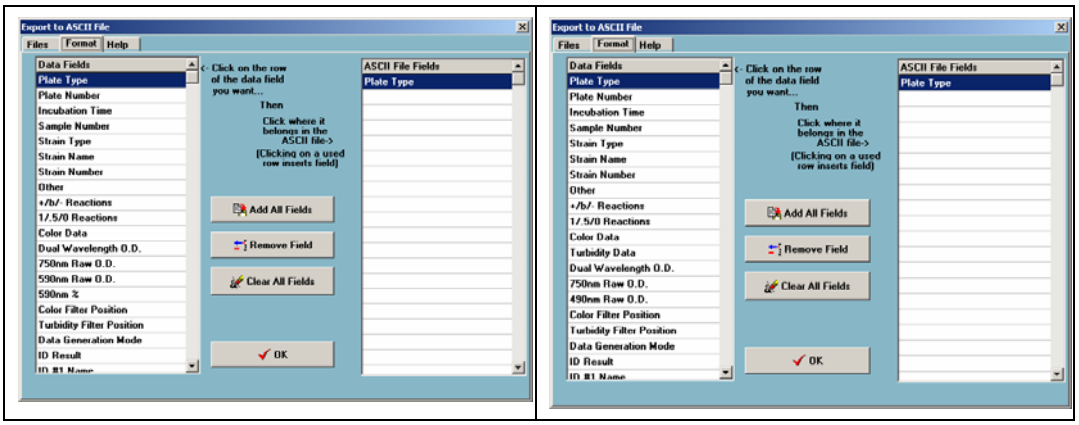
5. Click on the **ASCII File to Get Data** field. An **ASCII Export File** dialog box appears.



ASCII EXPORT FILE DIALOG BOX

6. Use the **Save as type** pull-down list to select the format of the ASCII file you want to import.
   - **Text File** shows a list with a .prn or .txt extension.
   - **Comma Delimited** shows a list with a .csv extension.
   - **All Files** shows a list of all files
7. Type in the desired name for the ASCII file where you want to export the data or click on a previously created ASCII file to append to it. Be sure to use the correct file extension.
8. Click **Save**. The **ASCII Files** window reappears.
9. **Choose Type of Format**, click the radio button designating the format you desire for your ASCII file.
   - One-Line, Comma Delimited (see Section 7, page 17)
   - Line Delimited, Data 8x12 Space Delimited (see Section 7, pages 18-19)
   - Fixed 8x12 O.D. Format
   - Comma Delimited Files for Importing into MicroSoft's ACCESS database software
10. Click the **Format** tab or **Go To Format Page**. The **Export to ASCII File** window appears. The choices on the **Data Fields** list depend on the MicroPlate in the file you've chosen. For a definition of each of the **Data Fields** (refer to Section 7, page 20 lists).

MicroLog data file field information



(GN,GP,AN,YT) (FF)

ASCII EXPORT WINDOWS

11. If necessary, click **Clear All Fields** to clear fields from the right list.
12. Click **Add All Fields** to select all data fields for ASCII File Fields.
13. Click on the left (data) field you want, then click on the next empty row on the right (ASCII) field. This information will be exported from the ASCII file. Add all the desired information.

Note: Clicking on a previously used row inserts a field.

14. Click **Remove Field** and then the **ASCII File Fields** field to remove a selected Data Field.
15. Click **OK**. The **Files** window reappears.
16. Click **Convert Data File → ASCII File**.
17. Click **OK** to exit.
18. Minimize the MicroStation/MicroLog software.
19. Open the software where you wish to view the exported data.

Exporting to a .csv file for EXCEL

1. Choose **Comma Delimited** as the **Save as Type** at Step 6 in the procedure above.
2. Choose **One Line, Comma Delimited** at Step 9 above. All fields selected for export will be in one line across the columns of the EXCEL spreadsheet. Data Field titles will also be exported.

3. Open EXCEL after you have exported the desired data and minimized the MicroStation/MicroLog software.

4. Click on **File → Open**. Under **Files of type**, choose **Text Files**.

5. Move through the folders to the C: drive. Open the Biolog folder and look for the file where the data was exported

Note: The file extension may not appear, but you will see the EXCEL symbol on the icon next to the file.

6. Click on your file name. The file will open and data will appear with Data Field Headers.

7. Select **Format** from the toolbar.

8. Select **Column**.

9. Select **Auto Fit Selection**.

Note: The instructions for opening the file in EXCEL may vary slightly, depending on the version you're using.

Exporting as a .txt or .prn file for EXCEL

Note: Use this to export reaction results in an 8x12 format similar to software printouts.

1. Choose **Text File** as the **Save as type** at Step 6 in Section 7, page 15.

2. Choose **Line delimited, Data 8x12 Space Delimited** at Step 9 in Section 7, page 16. All fields selected for export will be on separate lines on the EXCEL spreadsheet. Data Field titles will not be exported.

3. Open EXCEL after you have exported the desired data and minimized the MicroStation software.

4. Click on **File → Open**. Under **Files of type:** choose **Text Files**.

5. Move up through the folders to the C: drive. Open the Biolog folder and look for the file where the data was exported

Note: The file extension may not appear, but you will see a text icon next to the file.

6. Click on your file. A **Text Import Wizard** box appears.

7. Choose file type as **Delimited**.

8. Click **Next**.

9. Under **Delimiters**, deselect **Tab** and select **Space**.

10. Click **Next**.

11. Click **Finish**.

12. Your file will open with all the Data Fields on separate lines. If you chose to export any +/- values or OD values they will be in an 8x12 format.

*Note: The instructions for opening the file in EXCEL may vary slightly, depending on the version you're using. There are **no** Data Field Headers for each field exported.*

Exporting as a .txt or .prn file for Microsoft Word

Note: Use this option to export reaction results in an 8x12 format similar to software printouts.

1. Choose **Text File** as the **Save as type** at Step 6 in Section 7, page 15.

2. Choose **Line Delimited, Data 8x12 Space Delimited** at Step 9 in Section 7, page 16. All fields selected for export will be on separate lines on the EXCEL spreadsheet. Data Field titles will not be exported.

3. Open Microsoft Word after you have exported the desired data and minimized the MicroStation/MicroLog software.

4. Click on **File → Open**. Under **Files of type:** choose **Text Files**.

5. Move up through the folders to the C: drive. Open the Biolog folder and look for the file where the data was exported.

Note: The file extension may not appear, but you will see a text icon next to the file.

6. Click on your file name. A **File Conversion** box appears.

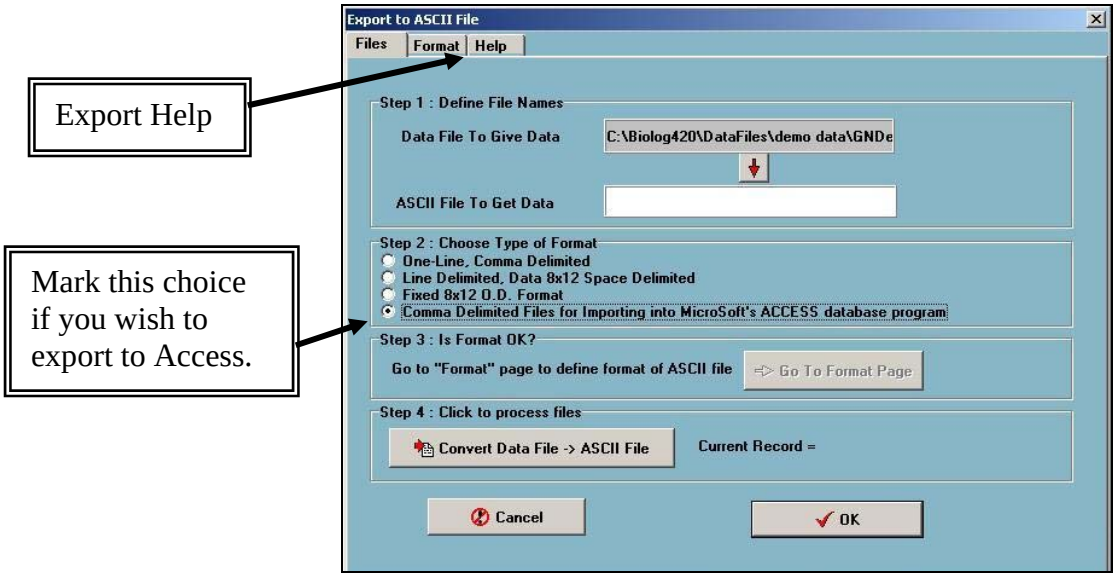
7. Choose **Plain text** as the encoding loading this file.

8. Click **OK**.

9. Your file will open with all the Data Fields on separate lines. If you chose to export any +/- values or OD values they will be in an 8x12 format.

Exporting to Microsoft Access

You may also wish to export data to Microsoft Access. This can be done by clicking the **Export to ASCII File** button on the **Data File** window. In the Step 2 box mark the comma delimited for Access format. For further information on exporting into Access, please see the Help tab on the **Export to ASCII File** window (see below).



ASCII Export Window Entries

- Date: Date data was saved
- Plate Type: GN, GP, YT, FF, etc. required and selected from saved file
- Plate Number: number you designated for plate information
- Incubation Time: time you designated depending on MicroPlate type
- Sample Number: number you designated for plate information
- Strain Type: GN-ENT, or GN-NENT, etc., determined by the MicroPlate type
- Strain Name: name you designated for plate information
- Strain Number: number you designated for plate information
- Other: information you add to further describe sample
- "+/b/-" Reactions: results from reading MicroPlate displayed as:
    - "+" = positive
    - "-" = negative
    - "b" = borderline
- 1/0.5/0 Reactions: OD display of results if reactions read manually
    - 1 = positive
    - 0 = negative
    - 0.5 = borderline
- Dual Wavelength Data (DWD): O.D. data on printouts if GN, GP, AN, MT or Eco plate is read from a MicroStation Reader = $[(590nm–750nm)_x – (590nm\text{-}750nm)_{A1}]$ X 1000, where x=any well
- Dual Wavelength O.D. (DW): OD difference data if GN, GP, AN, MT, or Eco plate read from a MicroStation Reader = $(590nm–750nm)_x$, where x=any well
- 750nm O.D.: Raw O.D. read at 750 nm from MicroStation Reader
- 590nm O.D.: Raw O.D. read at 590 nm from MicroStation Reader
- 590nm %: O.D. data on printouts if YT, SFN, or SFP plate read from a MicroStation Reader=
- 590nm % = $\frac{(590nm_x – A1)}{}$ x 100, where x=any well
- 590nm Filter Position: position 5
- 750nm Filter Position: position 6
- Data Generation Mode: Manual or Reader
- ID Result: Message if there is NO ID or Genus species name if ID obtained from reading MicroPlate
- ID #1 Name: Genus species name of organism listed as first choice on printout of results
- ID #1 SIM: SIM of organism listed as first choice on printout of results
- ID # 1 DIS: DIS of organism listed as first choice on printout of results
- ID #2 Name: Genus species name of organism listed as second choice on printout of results
- ID #2 SIM: SIM of organism listed as second choice on printout of results
- ID # 2 DIS: DIS of organism listed as second choice on printout of results
- ID #3 Name: Genus species name of organism listed as third choice on printout of results
- ID #3 SIM: SIM of organism listed as third choice on printout of results
- ID # 3 DIS: DIS of organism listed as third choice on printout of results

ASCII Export Window Entries (Unique Entries for FF)

- Color Data: O.D. Data on FF printouts for color data =
- $[(490nm_x –490nm_{A1}) -(750nm_x –750nm_{A1})]$ X 1000, where x=any well.
- Turbidity Data: O.D. Data on FF printouts for turbidity data =
- $(750nm_x –750nm_{A1})$ X 1600, where x=any well.
- Dual Wavelength O.D. (DW): OD readings at 490 nm and 750 nm minus the A-1 well:
- $(490nm_x - 450nm_{A1})$, where x=any well.
- $(750nm_x - 750nm_{A1})$, where x=any well.
- 750nm O.D.: Raw O.D. read at 750 nm from MicroStation Reader.
- 490nm O D: Raw O.D. read at 490 nm from MicroStation Reader.
- Color Filter Position: 490nm, position 3
- Turbidity Filter Position: 750nm, position 6

Cluster Analysis

Cluster analysis uses a mathematical approach to display the relative similarities and differences between strains or species based on pattern matching. It offers a visual method for examining groups using linear dendrograms and two- and three-dimensional cluster diagrams. You can generate cluster analyses on groups of entries in Biolog's database or your own database.

The math behind cluster analysis

Dendrograms are generated using a modified UPGMA analysis developed by Biolog (algorithm for constructing rooted phylogenic trees). The algorithm uses DIST values to generate the branching structure of the dendrogram. A DIST value of 14 is usually used as a cutting level to separate genera. This value has been empirically determined to be an appropriate one for most genera of gram-negative bacteria.

Once the software generates a preliminary dendrogram, it makes a second pass, rotating all branch points to their most preferred position. This best maintains proximity of related strains or species. If the distance between strains or species adjacent to cut points is less than 14, they are joined with a dashed line that indicates their actual distance.

By mathematically removing the linear constraints of the dendrogram, the software can generate two- and three-dimensional diagrams of DIST relationships.

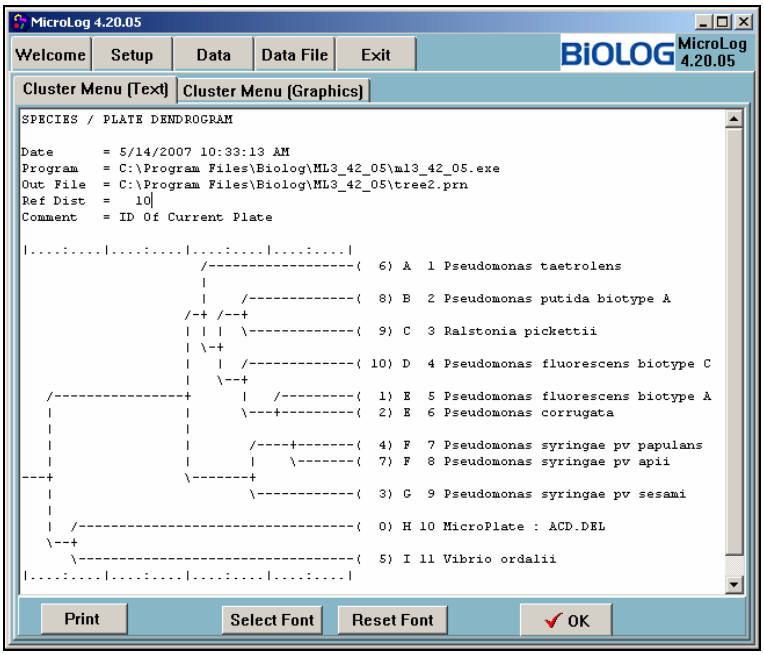
All of these cluster diagrams are only approximations of true relationships. With 95 carbon source tests, it would take 95-dimensional space to provide fully detailed clustering. As a practical matter, the linear dendrograms and two- and three-dimensional diagrams give very satisfactory representations.

Using cluster analysis with IDs

1. Once you get a species ID, click the **Cluster Menu** selection bar on the **Data** window.

2. The screen shows a dendrogram of your ID.

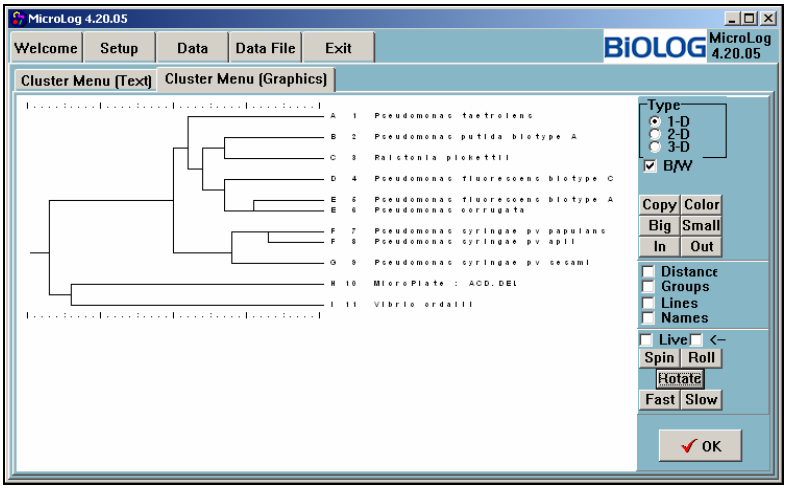
Dendrogram numbering:
➔The number in ( ) is one less that the corresponding number found in the data file record.
➔The numbering here begins with 0
➔Data file numbering begins with 1



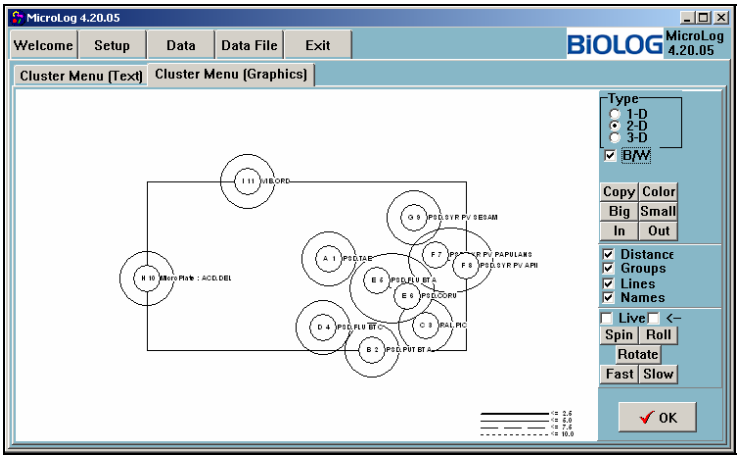
CLUSTER MENU (TEXT)

3. Click on the black line below or above the dendrogram to scroll.

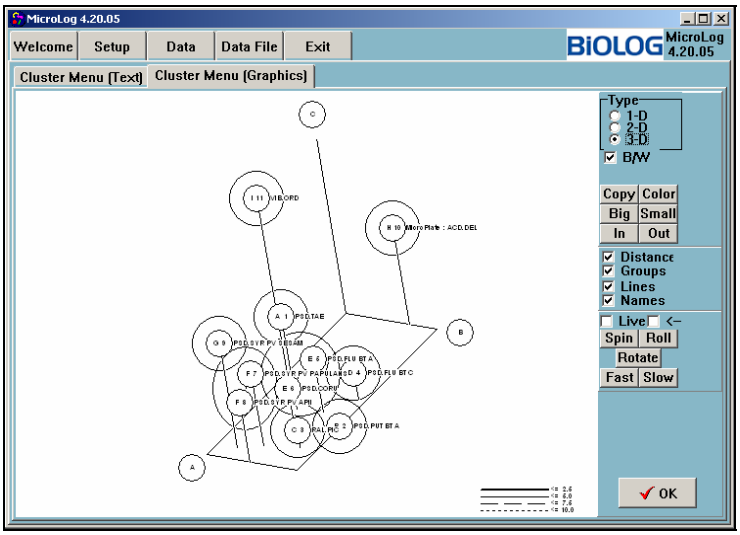
4. Click the **Cluster Menu (Graphics)** tab to view one-dimensional, two-dimensional, and three-dimensional cluster analyses.



ONE-DIMENSIONAL (1-D) CLUSTER ANALYSIS



TWO-DIMENSIONAL (2-D) CLUSTER ANALYSIS



THREE-DIMENSIONAL (3-D) CLUSTER ANALYSIS

5. Design your cluster according to your preferences.

   - Select **B/W** for a black and white representation.
   - Select **Copy** to paste your cluster into a text document (print screen).

   Note: Copy to Paint and use the cut and paste feature to place a "cluster only" picture into a Word document.

   - Select **Color** to choose the color scheme you want.
   - Select **Big** to enlarge your species.
   - Select **Small** to shrink your cluster.

- Select **In** to zoom in on cluster.
- Select **Out** to zoom out on cluster.
- Select **Distance** to designate the distances between organisms with lines and to note the distances with a key in the lower right corner of the cluster.
- Select **Groups** to encircle the entries that are in the same groups in the dendrogram.
- Select **Lines** in the three-dimensional cluster to draw a line from each organism to the base.
- Select to the left of **Live** to enable the spin of the three-dimensional cluster left.
- Select to the right of **Live** to enable the spin of the three-dimensional cluster right.
- Click on **Spin, Roll, and /or Rotate, Fast or Slow**, to capture the best view of your cluster.

6. Click **Print** to print any diagram. (Note: "Live" feature must be disabled to print cluster diagram)

Note: When searching your own database, you can view and print dendrograms, 2-D, and 3-D cluster diagrams by following the instructions above in "Using cluster analysis with IDs."

Using cluster analysis with collected data

To obtain a dendrogram displaying the spatial relationships between your own organisms in a saved data file, refer to "Printing Data Headers, Species Counts, and Dendrograms" beginning on page 7-13.

1. From the **Compile** window, enable the desired box:

- Make Index Files
- **Print Species/Plate Dendrograms** (to generate one dendrogram for each MicroPlate)

2. When the data file compiles, printouts of your dendrograms will display linear relationships.

8. Administration and Security

In this section:

The software runs in Restricted or Unrestricted Access Mode, a term that may be familiar from experience with the OmniLog® System. Let's review what Restricted Access Mode does and why it is important.

What is Restricted Access Mode?

Restricted Access Mode requires that only users with Administrator privileges have the ability to oversee and control access to the software.

The Administrator will:

- Assign Usernames and passwords for those who will use the system.
- Assign access privileges to each user.
- Oversee the security of the system

Restricted Access Mode requires all users to Log-In with a Username and password when entering the software or changing users. The software maintains files of the **User List**, **Log-In Log and Log-In Log Archive** to keep track of registered users, access privileges, and Log-In/out activity in the system.

All of these files are encrypted. The Log-In Log Archive files can be placed by the Administrator in the computer/network location of their choosing. This allows the Administrator to place the files in a location that has secured access.

Why Restricted Access Mode?

Restricted Access Mode ensures that data integrity and security controls are implemented in accordance with the guidelines of 21 CFR Part 11. It assists in compliance with federal Current Good Manufacturing Practices (cGMP) by ensuring the integrity of software use and electronic files.

Security Features:

- User List and Log-in Log
- Notification of failed Log-In attempts

- User password change
- User privileges
- Session time-out
- Password expiration
- Log-in archive

21 CFR Part 11: Only restricted data should be imported. (global setting)

Electronic record integrity:

- Limiting access
- Original record integrity
- Documentation of changes (by whom and when)
- Audit trails

What if I don't work in a 21 CFR compliant environment?

No problem!

- It is easy for the software Administrator to assign full access privileges to anyone in your organization who will be using the software.
    - This will give everyone the ability to use all of the system's features, with the exception of the ability to access the Administration Options button.
    - All records will contain the Username of the individual users

Other options are:

- Simply to use the Administrator ID and password for all users, thereby giving everyone equal access.
- Select to run the software in Unrestricted mode.

First Log-In and Setting up an Administrator

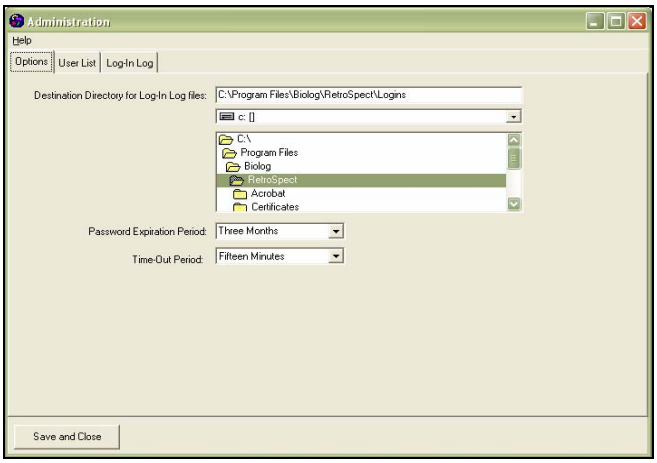
Please refer to *Section 2, page 2* for full instructions on how to set up an Administrator and Log-In to the software for the first time. Ideally, this will be done soon after the software is installed.

Administrator Options

The Administrator (or a user with Administrator access rights) uses the Administration Options button, located on the Welcome window, to register new users and assign access privileges, as well as manage security controls. This button is only available when the software Administrator or a user with Administration access is Logged In; in all other cases it will not appear on the Welcome window.

Options Tab

Once you have selected the Administration Options buttons, the **Administration** window will open. By default, it will appear with the **Options** tab selected. Make your selections from the available options and then click the **Save and Close** button.



- **Destination Directory for Log-In-Log files**
  Shows the default directory where Log-In Log Archive files are saved. Select the desired directory to place in the computer/network location of your choosing. You should select a secure location (for example, in a secure server or a password protected file folder).
- **Password Expiration Period**
  Use the pull down menu to select either **Three Months** or **One Minute**. The default is three months. This requires all users to select new passwords after 3 months. Select one minute to expedite validation testing only.
- **Time-Out Period**
  Use the pull down menu to select either **Fifteen Minutes** or **10 seconds**. The default is fifteen minutes. Select **10 seconds** to expedite validation testing only. Please refer to *Timed Log Out* in *Section 3, Pg. 5* for more information.
- **Restricted Access Mode**
  Click on the checkbox to change the mode (make sure there's a check in the box if you want Restricted Access mode.

Important!

- **If you test Password Expiration Period or Time Out Period features using system clock changes, the software must be closed when system clock changes are made.**
- **If not the Administration screen may appear with each Administrator Log-in until 100 Log-In/Log-Outs occur.**

Remember:

- **A user name must be at least 1 character in length.**
- **The password must be at least 6 characters in length, contain at least one number, and is case sensitive.**

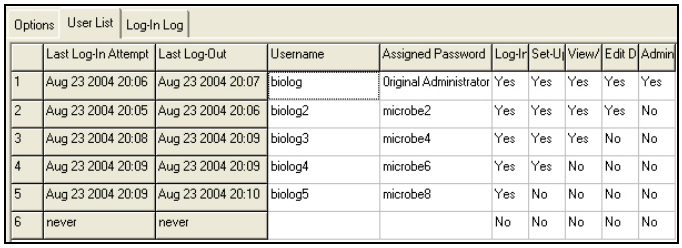
Creating a User List

From the **Administration** window, select the **User List** tab. Go to this list to add new users and assign levels of software access to those users, or to make changes to their level of access. User names can never be changed or deleted.

Once the administrator adds a new user name to the user list, that name can never be deleted or changed.

Adding new users and Assigning Privileges

1. Click the **User List** tab. A numbered list will appear, showing all users registered to that point, starting with the original Software Administrator (in row 1).
2. To add a new user, click in the next blank field in the **Username** column. Enter the new user name.



	Last Log-In Attempt	Last Log-Out	Username	Assigned Password	Log-In	Set-U	View/	Edit D	Admin
1	Aug 23 2004 20:06	Aug 23 2004 20:07	biolog	Original Administrator	Yes	Yes	Yes	Yes	Yes
2	Aug 23 2004 20:05	Aug 23 2004 20:06	biolog2	microbe2	Yes	Yes	Yes	Yes	No
3	Aug 23 2004 20:08	Aug 23 2004 20:09	biolog3	microbe4	Yes	Yes	Yes	No	No
4	Aug 23 2004 20:09	Aug 23 2004 20:09	biolog4	microbe6	Yes	Yes	No	No	No
5	Aug 23 2004 20:09	Aug 23 2004 20:10	biolog5	microbe8	Yes	No	No	No	No
6	never	never			No	No	No	No	No

3. Click in the blank **Assigned Password** field next to that new user name. Enter a temporary password for that new user.
4. Click in each Privilege box to the right, toggling between **Yes** and **No** to assign or deny specific access levels to that user.
5. Click the **Save and Close** button when you are finished.
6. Give the Username and Password to the person you have registered, and refer them to *Logging In and Out (*starting on Pg. 4, Section 3), if they need help logging into and out of the software. Remember that the password you have chosen is only temporary; the user will be prompted to enter a new password the first time they Log-In to the system.

Each new user must be assigned a level of software access by the Administrator. Consult Table 9-1 for a listing of these privileges.

Log-In Privileges

Privilege	What It Allows	What It Does Not Allow
Log-In	User will be able to Log-In and out of MicroLog software using a password, and will be able to use the Set Up Input and Data features (to enter MicroPlate information, read MicroPlates, and print results. All Data will be saved automatically).	User cannot use Data Management functions
Set-Up	User will be able change screen colors and fonts, will be able to access the Detailed Reader Setup page (for troubleshooting), and can disable the Auto Save feature.	User cannot use Data Management functions
View/Print	User will be able to view or print data files	User cannot edit data files
Edit	User will be able to use all Data Management features, including editing data files and compiling databases.	User cannot perform any Administrator functions
Admin	User will have complete access to all aspects of the software (just like the software administrator).	User cannot delete or change user names

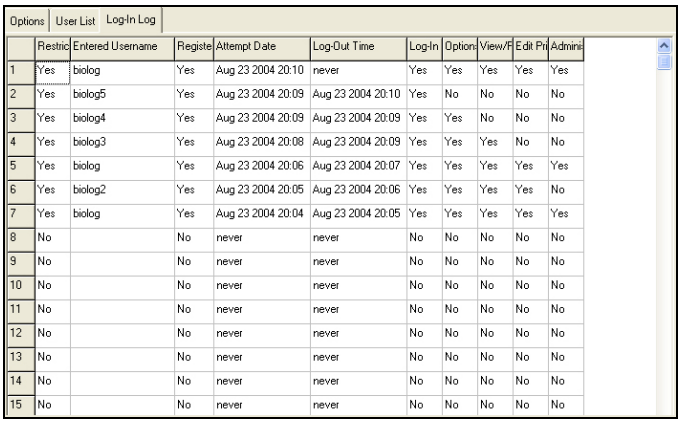
TABLE 8-1: USER ACCESS PRIVILEGES, IN DESCENDING ORDER OF LOWEST TO HIGHEST LEVELS OF ACCESS.

Viewing the Log-In Log

View the Log-In Log by selecting the **Log-In Log** tab on the **Administration** window. This feature of the software keeps meticulous track of the software's use in descending order of date (with the most recent date and log-in first). This log is non-editable.

The Log-In Log records the past 100 log-in attempts. For each log-in attempt, the Log-In Log records the username, date and time logged-in, whether the username is registered, and the date and time the person logged-out. The log also records which privileges registered users have, and shows the software is in Restricted Access Mode. This creates an audit trail. As log-in records in excess of 100 drop from the list, they are saved to a "Read-Only" file (Logins/LoginLogXXXXX.csv[1]). When this saved Log-In Log archive file contains 100 records, subsequent records will be saved to a new Log-In Log archive file with a different date stamp[1].

[1] XXXXX is a five-digit date stamp



Options | User List | Log-In Log

	Restric	Entered Username	Registe	Attempt Date	Log-Out Time	Log-In	Options	View/P	Edit Pri	Admini
1	Yes	biolog	Yes	Aug 23 2004 20:10	never	Yes	Yes	Yes	Yes	Yes
2	Yes	biolog5	Yes	Aug 23 2004 20:09	Aug 23 2004 20:10	Yes	No	No	No	No
3	Yes	biolog4	Yes	Aug 23 2004 20:09	Aug 23 2004 20:09	Yes	Yes	No	No	No
4	Yes	biolog3	Yes	Aug 23 2004 20:08	Aug 23 2004 20:09	Yes	Yes	Yes	No	No
5	Yes	biolog	Yes	Aug 23 2004 20:06	Aug 23 2004 20:07	Yes	Yes	Yes	Yes	Yes
6	Yes	biolog2	Yes	Aug 23 2004 20:05	Aug 23 2004 20:06	Yes	Yes	Yes	Yes	No
7	Yes	biolog	Yes	Aug 23 2004 20:04	Aug 23 2004 20:05	Yes	Yes	Yes	Yes	Yes
8	No		No	never	never	No	No	No	No	No
9	No		No	never	never	No	No	No	No	No
10	No		No	never	never	No	No	No	No	No
11	No		No	never	never	No	No	No	No	No
12	No		No	never	never	No	No	No	No	No
13	No		No	never	never	No	No	No	No	No
14	No		No	never	never	No	No	No	No	No
15	No		No	never	never	No	No	No	No	No

THE LOG-IN LOG

Table 8-2 defines each of the columns in the Log-In Log and describes what they mean.

Interpreting the Log-In Log

Column Name	Information Given
Restricted	If software was in Restricted Access mode when user logged-in, this entry will say **Yes**; if software was operating in Unrestricted Access mode, this entry will say **No.**
Entered Username	The user name of each person who logged in is listed here.
Registered	If this person was an approved user, this entry will say **Yes**; if not, this entry will say **No**.
Attempt Date	This is the exact date and time the user logged in (or attempted to do so).
Log-Out Time	This is the exact date and time the user logged out. The entry here will read **Never** in the event of a failed log-in and when the software administrator is currently using the software.
User Privileges	
Log-In	**Yes** if access was given during that log-in period; **No** if not
Option	**Yes** if access was given during that log-in period; **No** if not
View/Print	**Yes** if access was given during that log-in period; **No** if not
Edit	**Yes** if access was given during that log-in period; **No** if not
Admin	**Yes** if access was given during that log-in period; **No** if not

TABLE 8-2: INFORMATION IN THE LOG-IN LOG.

Changing or Lost Passwords

The software requires that all users **Log-In** with a password to enter the software. This ensures a secure environment by controlling access to the software. A user can change his or her password at any time.

Remember that the password must be at least 6 characters in length, contain at least one number, and is case sensitive.

Changing your Password

1. **Log-In** to the software.
2. At the **Welcome** window, select the **Change Password** button.
3. The Change Password dialog box appears.
4. Enter the password that was assigned to you, then enter a password chosen by you and reenter it.
5. Click **OK**.

NOTE: The software will not allow the use of the last four passwords established for a given user name.

CHANGE PASSWORD DIALOG WINDOW

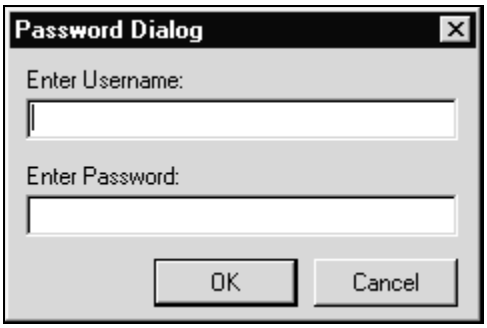
Lost or Revoked Password

Occasionally, a user might simply forget or misplace their password. The user may have attempted entry 5 times with the incorrect password. If the user is NOT the only Administrator, this situation is easily remedied. Any Software Administrator can easily go to the **User List** under **Administration** and assign the person a new password. Make sure to re-assign the user's privileges as well, or the new password will not work.

Logging In

When the system is operating in Restricted Access Mode, all users must Log-In when starting up the software or changing users.

1. When starting up the software, the software will automatically show a **Password Dialog** window. Enter your user name and password, and then click **OK**. After a few seconds, the **Welcome** window will appear.



PASSWORD DIALOG WINDOW

2. If the software is already open and it is necessary to change users, go to the **Welcome** window and click **Change Users**. A **Password Dialog** window will appear. Enter the new user's name and password.

Unauthorized log-in attempts

If someone enters an incorrect user name and/or password, the software will allow five attempts to enter the information correctly. After five attempts, the software will automatically close.

Subsequent attempts to open the software and Log-In using an incorrect user name or password will result in a warning tone and screen message noting that "Unauthorized Access Has Been Attempted."

The message will remain until the Administrator clicks on the message while in the **Administration** screens.

9. Technical Notes

In this section:
➔Materials List
➔Media Preparation
➔Specialized MicroPlates

This section gives specific information regarding consumable materials you'll need to perform microbial identifications, as well as instructions for how to prepare isolation media and inoculating fluid.

Materials List

	Item	Description
Media	BUG + B	Growth medium for gram-negative and gram-positive bacteria
	BUG + M	Growth medium for gram-positive spore-forming rods
	BUG	Growth medium for agricultural bacteria
	BUA	Growth medium for anaerobes
	BUY	Growth medium for yeasts
	CHOC	Growth medium for fastidious gram-negative bacteria
	2% ME	Growth medium for filamentous fungi (and select yeast species)
Inoculating Fluid	GN/GP-IF	Inoculating fluid for gram-negative and gram-positive bacteria
	AN-IF	Inoculating fluid for anaerobic bacteria
	FF-IF	Inoculating fluid for filamentous fungi (and select yeast species)
	Sterile water	Inoculating fluid for yeasts
	Salicylate	Inoculating fluid additive for some microbes
	Thioglycolate	Inoculating fluid additive for some microbes (available in droppers)
Miscellaneous Supplies	Streakerz	Sterile 6" pointed streaking sticks
	LongSwabs™	Sterile 7" cotton-tipped swabs
	Transfer pipettes	Sterile 6" disposable pipettes, graduated tip, 5 ml
	Reagent reservoirs	Sterile reservoirs
	Test tube rack	Autoclavable, holds 40 tubes, 20 mm diameter
	Pipette tips	Sterile, racked, for repeating multichannel pipettor
	Pipette tips, filtered	Sterile, filtered, racked, for repeating multichannel pipettor
	MicroPlate lids	Gamma irradiated MicroPlate lids
MicroPlates	GN2 MicroPlates	MicroPlates for gram-negative bacteria
	GP2 MicroPlates	MicroPlates for gram-positive bacteria
	AN MicroPlates	MicroPlates for anaerobic bacteria
	YT MicroPlates	MicroPlate for yeasts
	FF MicroPlates	MicroPlates for filamentous fungi (and select yeast species)

TABLE 9-1. CONSUMABLE MATERIALS AND EQUIPMENT

Media Preparation

> Caution!
> **If you're making your own media, follow instructions exactly. Take care to avoid contamination.**

Biolog can provide you with all the pre-made media you will need for microbe identification. However, you can also prepare your own media, using Biolog's formulas.

Making Biolog Universal Growth Agar + blood (BUG + B)

1. Mix the following in a 2-3 liter container:
   - 57 grams BUG Agar
   - 950 ml purified, distilled, or deionized water
2. Gently boil mixture while stirring to dissolve the agar and other components.
3. Cool an aliquot and measure the pH. Adjust pH with NaOH or HCl to achieve a final pH of 7.3 $\pm$ 0.1 at 25° C.
4. Sterilize by autoclaving at 15 pounds of pressure and 121° C for 15 minutes.
5. Cool to 45-50° C.
6. Add 50 ml sterile fresh defibrinated sheep's blood just prior to dispensing and mix gently. (Use good quality blood with a hematocrit of at least 40%).
7. Dispense into sterile petri dishes.

Making Biolog Universal Growth Agar + maltose (BUG + M)

1. Follow steps 1-5 above for BUG + B, except use 990 ml purified water.
2. Add 10 ml sterile solution of 25% maltose and mix thoroughly.
3. Dispense into sterile petri dishes.

Making Biolog Universal Growth Agar (BUG)

1. Mix the following in a 2-3 liter flask:
    - 57 grams BUG Agar
    - 1,000 ml purified, distilled, or deionized water
2. Gently boil while stirring to dissolve the agar and other components.
3. Cool an aliquot and measure the pH. Adjust pH with NaOH or HCl to achieve a final pH of 7.3 $\pm$ 0.1.
4. Sterilize by autoclaving at 15 pounds of pressure, at 121° C, for 15 minutes.
5. Cool to 45-50° C.
6. Dispense into sterile petri dishes.

Making Biolog Universal Anaerobe Agar + blood (BUA + B)

1. Mix the following in a 2-3 liter container:
    - 51.7 grams BUA Agar
    - 950 ml purified, distilled, or deionized water
2. While flushing with oxygen-free nitrogen gas, gently boil mixture while stirring to dissolve the agar and other components.
3. Cool an aliquot and measure the pH. Adjust pH with NaOH or HCl to achieve a final pH of 7.2 $\pm$ 0.1 at 25° C.
4. Sterilize by autoclaving at 15 pounds of pressure and 121° C for 15 minutes. Make sure the bottle is tightly capped to prevent the entry of oxygen.
5. Cool to 45-50° C under a stream of oxygen-free nitrogen gas.
6. Add 50 ml sterile fresh defibrinated sheep's blood just prior to dispensing and mix gently. (Use good quality blood with a hematocrit of at least 40%).
7. Dispense into sterile petri dishes in an anaerobic chamber.

Making Biolog Universal Yeast Agar (BUY)

1. Mix the following in a 2-3 liter container:
    - 60 grams BUY Agar
    - 1,000 ml purified, distilled, or deionized water
2. Gently boil while stirring to dissolve the agar and other components.
3. Cool an aliquot and measure the pH. Adjust pH with NaOH or HCl to achieve a final pH of 5.6 $\pm$ 0.4 at 25° C.
4. Sterilize by autoclaving at 15 pounds of pressure and 121° C for 15 minutes.
5. Cool to 45-50° C.
6. Dispense into sterile petri dishes.

Making 2% Malt Extract Agar

1. Mix the following in a 2-3 liter container:
    - 20 grams Oxoid Malt Extract (LP0039B)
    - 18 grams Bacteriological Grade Agar
    - 1,000 ml purified, distilled, or deionized water
2. Gently boil while stirring to dissolve the agar and other components.
3. Cool an aliquot and measure the pH. Adjust pH with NaOH or HCl to achieve a final pH of 5.5 $\pm$ 0.2 at 25° C.
4. Sterilize by autoclaving at 15 pounds of pressure and 121° C for 15 minutes.
5. Cool to 45-50° C.
6. Dispense into sterile petri dishes.

General hints for culture media preparation

- ☑ Keep dehydrated media powder in original bottles with lids tightly closed to avoid water absorption and deterioration.
- ☑ Use clean dry glassware that has been rinsed free of all soap residue.
- ☑ Add water to the vessel first, then weigh agar powder and add it to the vessel. Mix to obtain an even suspension. Do NOT fill the vessel more than two-thirds full (to avoid boiling over during heating and autoclaving).
- ☑ Heat agar gently, with constant stirring.

Making inoculating fluid (GN/GP-IF)

Biolog supplies pre-made inoculating fluid, with the following composition:

- 0.40% sodium chloride (NaCl)
- 0.03% Pluronic F-68 (e.g., Sigma P7061)
- 0.02% Gellan Gum (e.g., Phytagel™, Sigma P8169)

However, if you wish to prepare your own, using Biolog's formula.

1. Add 0.2 grams Gellan Gum to 1 liter of H_2O.
2. Heat to boiling, stirring constantly, until the Gellan Gum is completely dissolved.
3. Turn off the heat but continue stirring.
4. Add 4 grams NaCl and continue stirring until the NaCl is completely dissolved.
5. Add 0.3 grams of Pluronic F-68. Continue stirring until the Pluronic F-68 is completely dissolved.
6. Dispense the volume appropriate to obtain 19 ml post-autoclaving into 20 x 150 mm tubes.
7. Sterilize by autoclaving at 15 pounds of pressure and 121° C for 30 minutes.

*Note***:** *Gellan Gum concentration of 0.01-0.02% is acceptable.*

Making inoculating fluid (FF-IF)

Biolog supplies pre-made inoculating fluid, with the following composition:

- 0.03% Tween 40 (e.g., Sigma P1504)
- 0.25% Gellan Gum (e.g., Phytagel, Sigma P8169)

However, if you wish to prepare your own, using Biolog's formula.

1. Heat to boiling 1 liter of H_2O.
2. Add 2.5 grams Gellan Gum and 0.3 grams Tween 40. Stir.
3. Turn off the heat but continue stirring until all components are completely dissolved and the solution becomes clear.
4. Dispense the volume appropriate to obtain 16 ml post-autoclaving into 20 x 150 mm tubes.
5. Sterilize by autoclaving at 15 pounds of pressure and 121° C for 30 minutes.

Specialized MicroPlates

Biolog makes a series of additional MicroPlates for special applications. While there is currently no database for these, you can use them to create your own database with the software.

Table 9-2 lists these specialized MicroPlates and their uses. Contact Biolog or your Biolog Distribution Partner for more information.

Specialized MicroPlate	Use
SF-N2 and SF-P2 MicroPlates	For testing of Sporulating and Filamentous microorganisms (such as actinomycetes and fungi)
MT2 MicroPlate	Contains same nutrient base and color chemistry as GN MicroPlate, but without carbon sources. Add your own carbon sources to study the metabolic capabilities of any microbe of your choice.
EcoPlate	Contains the same color chemistry as the GN2 plate, but has three sets of 31 the identical carbon sources. *Note: the A1 well is used as the threshold algorithm control. Running different samples on one plate may affect the positive/negative/borderline calls.*

TABLE 9-2. BIOLOG SPECIALIZED MICROPLATES

10. Frequently Asked Questions

In this section:
➔Answers to Common Questions

Q *How I should I store my MicroPlates?*

A Unpack MicroPlates as soon as you receive them and keep them refrigerated until use. Biolog MicroPlates should be kept refrigerated (not frozen). MicroPlates are fairly stable at room temperature; we suggest refrigeration because they must be kept cold for maximum shelf life. At moderately warm temperatures, they slowly begin to deteriorate. Visually examine MicroPlates before using them. You may see faint yellow-brown or pink shades in wells when they are dry (this is OK). However, if wells show significant color immediately after inoculating the MicroPlate with the cell suspension, they have most likely been heat damaged.

Q *Do I have to handle frozen or lyophilized cultures in a special way?*

A Yes. Subculture frozen or lyophilized cultures two to three times before testing.

Q *Our lab would really like to use our own media. We know that our strains will grow on it. Is that all right?*

A No. However tempting it may be to use nonrecommended media, using anything other than Biolog-recommended media is a mistake. The carbon source tests in our MicroPlates are configured for precise metabolic reactions. The metabolic state of an organism has a profound influence on the resulting MicroPlate pattern that is the basis for identification. Many species will give fewer positive reactions when grown on non-recommended media. Use Biolog-recommended media only!

Q *Why is there a defined range for the turbidity of inocula?*

A It is essential to prepare inocula in a consistent and precise manner. The Biolog redox test chemistry is sensitive to oxygen concentration, which is determined by cell density. Use Biolog turbidity standards and calibrate your turbidimeter.

Q *Are Biolog's Turbidity standards comparable to McFarland standards?*

A Biolog's Turbidity standards have different set points and are not comparable to McFarland standards. Biolog's standards are set for cell densities at which the Biolog test performs optimally. Use of Biolog standards is necessary to achieve consistent and accurate results.

Q *Can I use one incubator for all my strains and set it at 32°-33°c instead of having two incubators at 30°c and 35°-37°c respectively?*

A Organisms grow better depending on the temperature of their environment. Biolog has chosen the temperatures at which the organisms in out database grow optimally. Using different temperatures than those recommended will decrease the performance of your Biolog ID system.

Q *We read our MicroPlates visually. Occasionally we are unsure whether a reaction is positive or negative. How should we enter those wells?*

A Light purple reactions are considered positive as long as the color is noticeable when compared to the A1 reference well. However, if you're still unsure, enter these reactions as "borderline." If, for example, you enter 4 out of 95 tests as borderline, the software will ignore the 4 borderline tests and base its identification on the remaining 91 tests. This will give you far more accurate results than guessing wrong about reactions you're not sure of.

Q *What should I do if I get different ID results at 4 hours and at 24 hours?*

A This is most often the result of having a mixed culture. See Section 4 for recommended procedures and examine your culture carefully to see if it is mixed. Also, consider the similarity value at one incubation time vs. the other. Environmental strains will often grow a little differently than the lab strains used to make the databases. Some strains may have a high similarity in our 4 hour database, while others match our 24 hour database more closely. Compare you similarity values to see which is a better match.

Q *Are there any genera where the taxonomy is still undergoing change?*

A Taxonomists have not yet agreed upon how all species should be delineated and microbiology is an ever-evolving science. We update and expand our software library on a continual basis, but at this point there are certain genera still undergoing revision. These include *Bacillus*, *Corynebacterium*, *Enterobacter*, *Pseudomonas*, *Aeromonas*, *Vibrio*, *Acinetobacter*, *Moraxella*, *Clostridium*, and *Candida.* **www.dsmz.de/bactnom** is a good site for current bacterial nomenclature. You can also link to this site through Biolog's web page. **www.cbs.knaw.nl** is a good site for current yeast and filamentous fungi nomenclature and information.

Q *Our lab is interested in your quality control and validation procedures. Where do we get this information?*

A Material Safety Data Sheets, Quality Control organism information, and Certificates of Performance are available on the website. Validation procedures, reagents kits and bacterial strains are available from Biolog.

11. Troubleshooting

In this section:

Carefully following the instructions in this guide will greatly minimize problems. Occasionally, however, you may get stuck or encounter difficulties. This section addresses the symptoms, causes, and solutions to those occasional problems. If you still can't figure out the cause of the problem, call Biolog Technical Service. We're always glad to help.

Additional help can be found on Biolog's website at www.biolog.com.

Gram Stain Identification

Since Gram stain readings start the chain of steps leading to a MicroStation/ MicroLog identification, it's essential to perform them according to standard lab protocol and to interpret results correctly.

☑ View the smear with a light microscope, using the oil-immersion objective. Gram-positive bacteria appear blue or violet; gram-negative bacteria appear pink or red.

☑ Gram-negative bacteria may appear gram-positive if the smear is too thick and decolorization is incomplete.

☑ Gram-positive bacteria may appear gram-negative if the smear is over-decolorized. This can also occur if the culture is not fresh and has reached stationary phase (some *Bacillus* species are gram positive for only a few divisions after spore germination). In addition, gram-positive bacteria will appear gram-negative if the integrity of their cell walls is damaged.

☑ To prevent misidentification, prepare light smears of young, actively growing cultures. Use known gram-positive and gram-negative controls. When you're determining organism morphology, perform Gram stains from liquid medium. Solid agar can affect the appearance of the organism.

Symptom	Cause	Solution
Gram variability	Smear is too thick	Make a single-cell-layer smear. Run positive and negative controls.
All smears appear gram negative	Overwarming of slides	Air dry slides completely before warming. Don't use a flame to fix slides.
	Using old cultures	Prepare slides from fresh log-phase growth cultures.
	Over-decolorizing	Repeat Gram stain, using specified timing. Run positive and negative controls.
Morphology unclear	Growth on agar media affects morphological appearance	Do a Gram stain from broth culture.
Too-intense color	Under-decolorizing	Use decolorizer made by same company that makes your stains. Prepare decolorizer or acetone/alcohol at several concentrations. Test solutions at 5, 10, and 15 seconds with known positive, negative, and weakly positive cultures. Run positive and negative controls.

Additional differentiation techniques

Make sure you're using proper Gram stain procedure. If you still get ambiguous results, use the following table as a guide:

Test	Reactions
Vancomycin sensitivity (30 μg disks)	Gram-negative bacteria → resistant Gram-positive bacteria → most are sensitive
Growth on MacConkey and CNA plates	Gram-negative bacteria → MacConkey +, CNA – Gram-positive bacteria → MacConkey –, CNA +
KOH test (3%)*	Gram-negative bacteria → suspension becomes thick and stringy
L-alanine aminopeptidase activity (use commercially available test strips impregnated with a colorimetric substrate for this enzyme)*	Gram-negative bacteria → + Gram-positive bacteria → –

*For test procedures, see *Bailey & Scott's Diagnostic Microbiology*, Baron E.J. and Finegold, S.M., C.V. Mosby Co., 1990, pages 102-103.

Culturing Microorganisms

Symptom	Cause	Solution
Poor overall growth	Using nonrecommended media	Use Biolog-recommended media.
Isolate takes several days to form a colony	Some environmental organisms take several days to become visible on growth plate, at which point culture may be too old for successful ID	Subculture one or two passages in broth medium. Set up two or three agar plates to obtain sufficient growth.
Bacterium will not grow on BUG + B or forms pinpoint colonies	Fastidious gram-negative bacteria need special culture conditions	Use Chocolate agar and incubate with elevated CO_2 at 35-37° C.
	Some environmental bacteria may be oligotrophic or temporarily in an oligotrophic state (i.e., they will only grow on low nutrient media such as R2A)	Try to subculture the bacterium from R2A and see if they will gradually adapt to growing on BUG + B. If not, it is a species that is not included in our MicroStation/MicroLog database. Agricultural bacteria may be grown on BUG without blood.
Slow growth and/or weak pattern formation	Sub-optimal growth temperature and/or humidity and/or atmosphere	Use specified incubating temperatures (see Section 4 and Appendices). If your unknown organism came from a cold or warm environment, grow it first at its environmental temperature, then try to grow it at 35-37° C, 30° C, or 26° C. Add a pan of water to provide humidity in your incubator. Incubate the MicroPlate at the same temperature as the growth plate.
Mixed growth on agar plates	Sticky bacterial surfaces	Transfer a colony into a few ml of GN/GP-If or sterile water, vortex for several seconds, and streak out from the cell suspension onto a medium that aids the detection of subtle differences in colony morphology. Take a single colony and streak for isolation on a separate plate. Repeat as necessary until you have a pure culture.
	Filamentous fungi mixed with bacteria	Cultures can be streaked on media containing antibacterial antibiotics. If this fails, use 1 drop of saline suspension of the mixed culture to inoculate each of four tubes of Sabouraud broth (1.0 ml). Add in series either 1,2,3 or 4 drops of concentrated HCl. Streak out from each tube.

Preparing Inocula

Symptom	Cause	Solution
Incorrect turbidity	Turbidimeter out of calibration	Calibrate accurately. Use correct standards. Make sure standards have not expired.
	Tubes not properly blanked	Once you blank a tube, do not rotate it while making suspension. Blank each suspension tube (tubes are not optically precise and can vary tube-to-tube and with rotation).
	Significant scratches or smudges on tube	Use suspension tubes only once, then discard. Visually inspect tubes before using. Wipe outside of tubes with a tissue before placing in turbidimeter.
Inaccurate %T measurements	Nonuniform suspension of cells	Use 7" swab to mix cells all the way to the bottom of the tube. The light path that looks through the tube is only viewing the bottom of the tube.
Trouble making a homogenous suspension	Mucoid or clumpy cells	For Spore Forming Gram positive Rods, Follow the recommendations on pages 4-10 to 4-12.
		For Non-Spore formers: 1. Roll swab over young colonies in 3rd and 4th quadrants. 2. Mash colonies against side of a sterile tube (above meniscus). 3. Add several ml of inoculating fluid and wash the sides of the tube with a cotton swab. 4. Mix well, then examine for clumps. If clumps are present, allow them to settle. 5. Transfer this concentrated inoculum into a fresh Inoculating Fluid tube until the recommended turbidity is reached. * Be careful not to transfer any colony clumps into the Inoculating fluid.
		1. For difficult organisms such as *Gornia* or *Tsukamurella*, suspend colonies as a dense suspension in a small amount of inoculating fluid as above. 2. Incubate as needed at 35° C (do not exceed 10 minutes). Vortex (if clumps still present, pull off supernatant and repeat). 3. Bring supernatant volume up to 18 ml and mix until homogenous.
Too few positive reactions in MicroPlates	Detergent traces in tube	Use suspension tubes only once, then discard.
	Use of "bad" water	Use high quality purified water without preservatives.

Inoculating MicroPlates

Symptom	Cause	Solution
Pipetting problems	Wells inoculated unevenly	Dispense first aliquot from pipettor back into reservoir. Depress lever smoothly and completely. Make sure tips are lined up evenly and tightly seated. Avoid pipetting or trapping air bubbles. Visually check wells after inoculating.
	Incorrect volumes used	100 µl for anaerobic bacteria, yeasts and fungal.
		150 µl for aerobic bacteria.

Incubating MicroPlates

Symptom	Cause	Solution
Poor growth or poor pattern formation in MicroPlates	Wrong incubation conditions Wrong MicroPlate Organism not in Database	Incubate according to specified temperature and conditions. See Section 4 and Appendices. Incubate the MicroPlate at the same temperature as the growth plate. Make sure incubator humidity is sufficient.
Wells at the four corners or edges of the MicroPlate have lower liquid levels after incubation	Incubator is too dry Filamentous fungi not incubated in a closed container	Add a pan of water to humidify incubator, or incubate MicroPlates in a plastic container humidified with moist paper towels. Make sure you have the FF MicroPlates in a closed container or in plastic bags on trays. Do not add additional moisture when incubating filamentous fungi.

MicroStation Reader

Symptom	Cause	Solution
Erratic or inaccurate reading	Moisture, scratches, or smudges on MicroPlate	Remove MicroPlate lid before reading. Wipe bottom of MicroPlate before putting into reader.
	Many borderline reactions on MicroPlate	Review all sample preparation procedures for correctness and accuracy.
	Reading artifacts	Always double-check results by eye. Verify that your visual reading coincides with reader results. Use the Histogram software function to manually adjust threshold if necessary.
Software won't communicate with or initialize reader	Wrong com port selected	Choose correct com port.
	Loose cable connection	Turn reader off. Unplug cable, then plug it back in. Turn reader on and try again.
	Unknown cause	Turn reader off and exit program. Restart program, turn reader on, and try again. The reader has its own error messages, which should be self-explanatory. Call Biolog Technical Service if you need further assistance.
	Reader Bulb is Out/Low	Use the System Check test in the Bio-Tek reader manual. (Use Air reference test in the Molecular Devices reader manual.)
MicroPlate won't go into reader	MicroPlate mispositioned	Make sure MicroPlate snaps into place and is seated levelly. Make sure MicroPlate lid is off before reading. Remove MicroPlate and reposition in reader tray. Make sure A1 well is at the top left. Verify that software is communicating with reader.

12. Glossary

In this section:
➔ **Definitions of Terms**

Anamorph

Asexual state for yeasts and filamentous fungi.

Ascospore

Sexual spore formed within an ascus in fungi of the division Ascomycota. There are usually 4 or 8 ascospores per ascus (sometimes 2 or multiples of 4).

Ascus

Cell in the shape of a sac (round, club-shaped or cylindrical) within which ascospores are produced.

Aseptic technique

Standard lab procedures used to prevent contamination.

Basidiospore

A sexual spore formed on the upper surface of a basidium in fungi of the division Basidiomycota. There are usually 4 basidiospores, sometimes 2, and rarely multiples of 4.

Basidium

A club shaped cell upon which basidiospores form.

Carbon source utilization

Basic process used to identify microbes based on the chemicals they can utilize.

Catalase test

Additional test used to characterize gram-positive bacteria.

Cluster analysis

Mathematical depiction of the relationship between closely related microbe identification patterns. Shows dendrograms and two- and three-dimensional diagrams.

Conidium

A unicellular or multicellular fungal element specialized to detach from the mycelium and disseminate, thus serving as an asexual reproductive structure.

Dendrogram
Cluster diagram in the form of a branching tree.

Endpoint ID (EID)
Biolog, Inc. developed pattern matching method which considers the daily endpoint determination.

Enteric
Gram-negative bacteria belonging to the group *Enterobacteriaceae*.

Freeze
The act of converting a database into a Read Only and non-editable format.

Gram negative
Bacteria showing typical pink or red reaction on Gram stains.

Gram positive
Bacteria show typical blue or violet reaction on Gram stains.

Histogram
Visual representation of MicroPlate color distribution and thresholds.

Hypha
Septate or aseptate filaments of a fungus.

Inocula
Cell suspension used to inoculate MicroPlates.

Inoculating fluid
Fluid used to prepare inocula.

Maltose
A sugar added to BUG Agar. Required for culturing spore-forming gram-positive rods (e.g., *Bacillus* species).

Manual mode
Software mode used to record MicroPlate reactions visually.

MicroStation/MicroLog software
Windows-based program for microbe identification.

MicroPlate
Plate with 95 carbon source utilization tests (one in each well), with A1 well as control. The MicroPlate for yeasts has 94 tests and two control wells (A1 and D1).

MicroPlate reactions
Positive, negative, and borderline color responses used to identify microbes.

MicroStation System
Comprehensive system for microbe identification, including computer, MicroStation/MicroLog software, MicroStation reader, pipettor, turbidimeter, and ancillary materials.

Non-enteric
Gram-negative bacteria not belonging to the group *Enterobacteriaceae*.

Oxidase test
Additional test used to characterize gram-negative bacteria.

Pattern
Color responses in MicroPlates.

Pleomorphic
Having various distinct forms or shapes exhibited by a single strain or species

Progressive ID (PID)
Biolog, Inc. developed pattern matching method which considers the progressive sequence in which purple wells are formed.

Pure culture
Culture containing only one microbe species.

Reader mode
Software mode used to register MicroPlate reactions from MicroStation Reader.

Read Only File
The MicroStation/MicroLog Program will prevent editing of designated Read Only files

Restricted Access mode
Mode set by system administrator to prevent unregistered users from using system; assign user names, passwords and privileges to each user; create an audit trail, and freeze data files to maintain data integrity.

Salicylate
Anticapsulate agent required as an addition to inoculating fluid for a few gram-positive species.

Sporangiospore
An asexual spore produced by cytoplasmic cleavage within a sporangium.

Spore, fungal

A fungal propagative element, produced either as part of a sexual process (ascospore, basidiospore, zygospore), or by an asexual reproductive process involving a process of cytoplasmic cleavage (sporangiospore).

Sterile, fungi

Used to describe a fungal culture which produces no spores or conidia.

Teleomorph

Sexual state for yeasts and filamentous fungi.

Thioglycolate

Anticapsulate agent required as an addition to inoculating fluid for gram-negative enteric bacteria, gram-negative fastidious bacteria, and gram-positive cocci and rods.

Thresholds

The optical boundaries between negative, borderline, and positive reactions.

TSI slant

Additional test used to characterize gram-negative bacteria.

Turbidity

Measurement of cloudiness, which is indicative of inocula cell densities.

Unrestricted Access mode

Mode set by system administrator to allow any user to use all software functions.

Zygospore

A sexual spore formed from the fusion of two similar cells called gametangia; this spore is characteristic of fungi in the division Zygomycota.

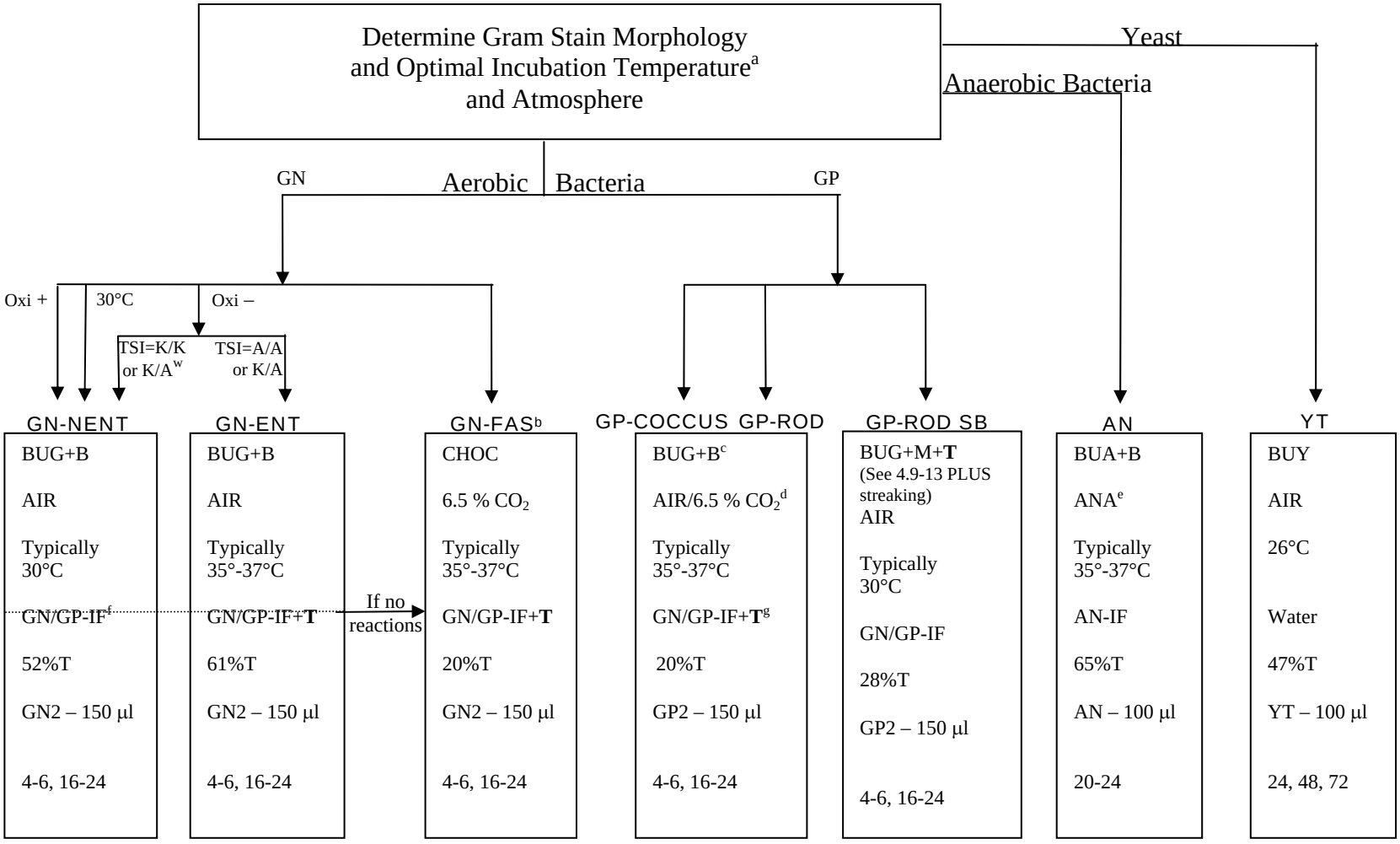
13. Appendices

In this section:
- **Plate Data Statistics**
- **Setup Flowcharts**
- **Database Species Lists and Their Characteristics**
- **Program Printouts**

Appendix 1: Data Statistics For Various Plate Types

Plate Type	General Read Statistics	ID specific limitations:	
		Minimum Number of positives to call an ID	Maximum number of borderline Reactions
GN, GP, MT or Eco:	-Dual wavelength color statistic (590, 750) -A1-zeroed OD 750 turbidity statistic -Progressive identification algorithm -0.75, 0.5 similarity cut-offs for 4-6 hour, and 24 hours	4-6 hour read 3 24 hour read 3	25 Borderline Reactions
AN:	-Dual wavelength color statistic (590, 750) -A1-zeroed OD 750 turbidity statistic -Progressive identification algorithm -0.5 similarity cut-offs for 20-24 hours	20-24 hour read 7	25 Borderline Reactions
YT or Other:	-Single wavelength color statistic (590) -End Point identification algorithm -0.75, 0.5, 0.5 similarity cut-offs for 24 hours, 48 hours, and 72 hours	24 hour read 3 48 hour read 3 72 hour read 3	25 Borderline Reactions
FF:	-Dual wavelength color statistic (490, 750) -A1-zeroed OD 750 turbidity statistic -End-point identification algorithm -0.9, 0.7, 0.65, 0.6, 0.6 similarity cut-offs for 1,2,3,4, and 7 days (7 day reading is present, however not included in the identification procedure)	24 hour 30 48 hour 25 72 hour 20 96 hour 15 168 hour 5	50 Borderline Reactions

Appendix 2: Release 4.2 Setup Flowchart (non-FF)



	GN-NENT	GN-ENT	GN-FAS[b]	GP-COCCUS	GP-ROD	GP-ROD SB	AN	YT
Culture Media	BUG+B	BUG+B	CHOC	BUG+B[c]	BUG+B	BUG+M+**T** (See 4.9-13 PLUS streaking)	BUA+B	BUY
Atmosphere	AIR	AIR	6.5 % CO_2	AIR/6.5 % CO_2[d]	Typically 35°-37°C	AIR	ANA[e]	AIR
Temperature	Typically 30°C	Typically 35°-37°C	Typically 35°-37°C	Typically 35°-37°C	Typically 30°C	Typically 30°C	Typically 35°-37°C	26°C
Inoculating Fluid	GN/GP-IF[f]	GN/GP-IF+**T**	GN/GP-IF+**T**	GN/GP-IF+**T**[g]	GN/GP-IF	GN/GP-IF	AN-IF	Water
Inoculum %T	52%T	61%T	20%T	20%T	28%T	28%T	65%T	47%T
MicroPlate - µl per well	GN2 – 150 µl	GN2 – 150 µl	GN2 – 150 µl	GP2 – 150 µl	GP2 – 150 µl	GP2 – 150 µl	AN – 100 µl	YT – 100 µl
Incubation Time (hours)	4-6, 16-24	4-6, 16-24	4-6, 16-24	4-6, 16-24	4-6, 16-24	4-6, 16-24	20-24	24, 48, 72

[a] With the exception of thermophiles, all species are either 26°C, 30° or 35°-37°C.
[b] Requiring CHOC or CO_2 for growth or forming <1 mm colonies on BUG+B.
[c] Agricultural species may be grown on BUG without blood.
[d] Air, unless organism requires CO_2 for growth.
[e] AN MicroPlate must be incubated in a hydrogen-free anaerobic atmosphere
[f] If control well (A1) is positive, add thioglycolate to inoculating fluid.
[g] If control well (A1) is positive, add 1 ml salicylate along with thioglycolate to inoculating fluid.

ABBREVIATIONS
T= Thioglycolate
Oxi = Oxidase; TSI = Triple Sugar Iron Slant; A = Acid, A^W = Weak Acid, K = Alkaline

Appendix 3: FF Setup Flowchart

Sample Preparation Process for FF MicroPlate

Initial culture medium	**2% ME**	
Wet prep results	**Hyphal elements**	**Yeast cells**
Microbe type	**Filamentous Fungi**	**Yeast**
Culture medium	2% ME	2% ME
Temperature	26° C	26° C
Atmosphere	Air	Air
Culture Incubation time	5 - 10 days	2 days
Inoculating fluid	FF-IF	FF-IF
Inoculum turbidity/ Turbidity standard	75% T FF	75% T FF
MicroPlate type/ µl per well	FF 100	FF 100
Incubation time (hours)	24, 48, 72, 96	24, 48, 72, 96

**Note: We recommend that filamentous fungi be manipulated in a biological safety cabinet.*

ABBREVIATIONS

2% ME	=	2% Malt Extract Agar
FF	=	Filamentous Fungi
%T	=	percent transmittance
IF	=	inoculating fluid

Notes:

Appendix 4: Database Species Lists and Their Characteristics

Gram-Negative Aerobic Bacteria

	Species Name	Type	Test	Thio	Medium	Atm	Temp
1	**"Achromobacter cholinophagum"**	GN-NENT	O+	N	BUG+B	Air	30
2	**Achromobacter xylosoxidans ss denitrificans**	GN-NENT	O+	N	BUG+B	Air	30
3	**Achromobacter xylosoxydans ss xylosoxidans**	GN-NENT	O+	N	BUG+B	Air	30
4	**Acidovorax avenae ss avenae**	GN-NENT	O+	N	BUG+B†	Air	30
5	**Acidovorax avenae ss cattleyae**	GN-NENT	O+	N	BUG+B†	Air	30
6	**Acidovorax avenae ss citruli**	GN-NENT	O+	N	BUG+B†	Air	30
7	**Acidovorax delafieldii**	GN-NENT	O+	N	BUG+B†	Air	30
8	**Acidovorax facilis**	GN-NENT	O+	N	BUG+B†	Air	30
9	**Acidovorax konjaci**	GN-NENT	O+	N	BUG+B†	Air	30
10	**Acidovorax temperans**	GN-NENT	O+	N	BUG+B†	Air	30
11	**Acinetobacter baumanii/genospecies 2**	GN-NENT	O-	N	BUG+B	Air	30
12	**Acinetobacter calcoaceticus bv alc**	GN-NENT	O-	N	BUG+B	Air	30
13	**Acinetobacter calcoaceticus/genospecies 1**	GN-NENT	O-	N	BUG+B	Air	30
14	**Acinetobacter calcoaceticus/genospecies 3**	GN-NENT	O-	N	BUG+B	Air	30
15	**Acinetobacter calcoaceticus/genospecies 13**	GN-NENT	O-	N	BUG+B	Air	30
16	**Acinetobacter genospecies 6**	GN-NENT	O-	N	BUG+B	Air	30
17	**Acinetobacter genospecies 10**	GN-NENT	O-	N	BUG+B	Air	30
18	**Acinetobacter genospecies 11**	GN-NENT	O-	N	BUG+B	Air	30
19	**Acinetobacter genospecies 14**	GN-NENT	O-	N	BUG+B	Air	30
20	**Acinetobacter genospecies 15**	GN-NENT	O-	N	BUG+B	Air	30
21	**Acinetobacter haemolyticus/genospecies 4**	GN-NENT	O-	N	BUG+B	Air	30
22	**Acinetobacter johnsonii/genospecies 7**	GN-NENT	O-	N	BUG+B	Air	30
23	**Acinetobacter junii/genospecies 5**	GN-NENT	O-	N	BUG+B	Air	30
24	**Acinetobacter lwoffii/genospecies 8/9**	GN-NENT	O-	N	BUG+B	Air	30
25	**Acinetobacter radioresistens/genospecies 12**	GN-NENT	O-	N	BUG+B	Air	30
26	**Actinobacillus capsulatus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
27	**Actinobacillus equuli**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
28	**Actinobacillus hominis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
29	**Actinobacillus indolicus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
30	**Actinobacillus lignieresii**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
31	**Actinobacillus minor**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
32	**Actinobacillus muris**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
33	**Actinobacillus pleuropneumoniae**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
34	**Actinobacillus porcinus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
35	**Actinobacillus rossii**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
36	**Actinobacillus salpingitidis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
37	**Actinobacillus seminis**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
38	**Actinobacillus suis**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
39	**Actinobacillus ureae**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
40	**Aeromonas allosaccharophila**	GN-NENT	O+	N	BUG+B	Air	30
41	**Aeromonas caviae DNA group 4**	GN-NENT	O+	N	BUG+B	Air	30
42	**Aeromonas encheleia**	GN-NENT	O+	N	BUG+B	Air	30
43	**Aeromonas enteropelogenes**	GN-NENT	O+	N	BUG+B	Air	30
44	**Aeromonas eucrenophila DNA group 6**	GN-NENT	O+	N	BUG+B	Air	30
45	**Aeromonas hydrophila DNA group 1**	GN-NENT	O+	N	BUG+B	Air	30
46	**Aeromonas hydrophila-like DNA group 2**	GN-NENT	O+	N	BUG+B	Air	30
47	**Aeromonas hydrophila-like DNA group 3**	GN-NENT	O+	N	BUG+B	Air	30
48	**Aeromonas ichthiosmia**	GN-NENT	O+	N	BUG+B	Air	30
49	**Aeromonas jandaei DNA group 9**	GN-NENT	O+	N	BUG+B	Air	30
50	**Aeromonas media DNA group 5b**	GN-NENT	O+	N	BUG+B	Air	30
51	**Aeromonas media-like DNA group 5a**	GN-NENT	O+	N	BUG+B	Air	30
52	**Aeromonas salmonicida ss achromogenes**	GN-NENT	O+	N	BUG+B	Air	30
53	**Aeromonas salmonicida ss masoucida**	GN-NENT	O+	N	BUG+B	Air	30
54	**Aeromonas salmonicida ss salmonicida**	GN-NENT	O+	N	BUG+B	Air	30
55	**Aeromonas schubertii DNA group 12**	GN-NENT	O+	N	BUG+B	Air	30
56	**Aeromonas sobria DNA group 7**	GN-NENT	O+	N	BUG+B	Air	30
57	**Aeromonas trota DNA group 13**	GN-NENT	O+	N	BUG+B	Air	30

†*Agricultural bacteria that may be grown on BUG without blood.*
*** Found in the Dangerous Pathogen database*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
58	**Aeromonas veronii DNA group 10**	GN-NENT	O+	N	BUG+B	Air	30
59	**Aeromonas veronii/sobria DNA group 8**	GN-NENT	O+	N	BUG+B	Air	30
60	**Alcaligenes faecalis ss faecalis**	GN-NENT	O+	N	BUG+B	Air	30
61	**Alysiella filiformis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
62	**Aminobacter aminovorans**	GN-NENT	O+	N	BUG+B	Air	30
63	**Ancylobacter aquaticus**	GN-NENT	O+	N	BUG+B	Air	30
64	**Aquaspirillum autotrophicum**	GN-NENT	O+	N	BUG+B	Air	30
65	**Aquaspirillum dispar**	GN-NENT	O+	N	BUG+B	Air	30
66	**Aquaspirillum metamorphum**	GN-NENT	O+	N	BUG+B	Air	30
67	**Aquaspirillum peregrinum ss integrum**	GN-NENT	O+	N	BUG+B	Air	30
68	**Aquaspirillum peregrinum ss peregrinum**	GN-NENT	O+	N	BUG+B	Air	30
69	**Aquaspirillum putridiconchylium**	GN-NENT	O+	N	BUG+B	Air	30
70	**Bergeyella zoohelcum**	GN-NENT	O+	N	BUG+B	Air	30
71	**Bordetella avium**	GN-NENT	O+	N	BUG+B	Air	35-37
72	**Bordetella bronchiseptica**	GN-NENT	O+	N	BUG+B	Air	35-37
73	**Bordetella hinzii**	GN-NENT	O+	N	BUG+B	Air	30
74	**Bordetella holmesii**	GN-NENT	O-	N	BUG+B	Air	30
75	**Bordetella parapertussis**	GN-NENT	O-	N	BUG+B	Air	35-37
76	**Bordetella pertussis**	GN-NENT	O+	N	BUG+B	Air	35-37
77	**Bordetella trematum**	GN-NENT	O-	N	BUG+B	Air	30
78	**Bordetella-like species**	GN-NENT	O+	N	BUG+B	Air	35-37
79	**Brenneria rubrifaciens**	GN-ENT	O-	N	BUG+B†	Air	30
80	**Brenneria salicis**	GN-ENT	O-	N	BUG+B†	Air	30
81	**Brevundimonas diminuta**	GN-NENT	O+	N	BUG+B	Air	30
82	**Brevundimonas vesicularis**	GN-NENT	O+/-	N	BUG+B	Air	30
83	**Brucella melitensis (abortus)**	GN-FAS	O+	N	CHOC**	6.5%CO2	35-37
84	**Brucella melitensis (abortus, melitensis)**	GN-FAS	O+	N	CHOC**	6.5%CO2	35-37
85	**Brucella melitensis (melitensis)**	GN-FAS	O+	N	CHOC**	6.5%CO2	35-37
86	**Brucella melitensis (suis, canis)**	GN-FAS	O+	N	CHOC**	6.5%CO2	35-37
87	**Brucella melitensis (suis)**	GN-FAS	O+	N	CHOC**	6.5%CO2	35-37
88	**Budvicia aquatica**	GN-ENT	O-	Y	BUG+B	Air	35-37
89	**Burkholderia andropogonis**	GN-NENT	O+/-	N	BUG+B†	Air	30
90	**Burkholderia caryophylli**	GN-NENT	O+	N	BUG+B†	Air	30
91	**Burkholderia cepacia**	GN-NENT	O+/-	N	BUG+B†	Air	30
92	**Burkholderia gladioli**	GN-NENT	O+/-	N	BUG+B†	Air	30
93	**Burkholderia glathei**	GN-NENT	O+	N	BUG+B†	Air	30
94	**Burkholderia glumae**	GN-NENT	O+	N	BUG+B†	Air	30
95	**Burkholderia mallei**	GN-NENT	O+/-	N	BUG+B†**	Air	30
96	**Burkholderia multivorans**	GN-NENT	O+	N	BUG+B†	Air	30
97	**Burkholderia phenazinium**	GN-NENT	O+	N	BUG+B†	Air	30
98	**Burkholderia plantarii**	GN-NENT	O+	N	BUG+B†	Air	30
99	**Burkholderia pseudomallei**	GN-NENT	O+	N	BUG+B†**	Air	30
100	**Burkholderia pyrrocinia**	GN-NENT	O-	N	BUG+B†	Air	30
101	**Burkholderia vietnamiensis**	GN-NENT	O+	N	BUG+B†	Air	30
102	**Buttiauxella agrestis**	GN-ENT	O-	Y	BUG+B	Air	35-37
103	**Buttiauxella brennerae**	GN-ENT	O-	Y	BUG+B	Air	35-37
104	**Buttiauxella ferragutiae**	GN-ENT	O-	Y	BUG+B	Air	35-37
105	**Buttiauxella gaviniae**	GN-ENT	O-	Y	BUG+B	Air	35-37
106	**Buttiauxella izardii**	GN-ENT	O-	Y	BUG+B	Air	35-37
107	**Buttiauxella noackiae**	GN-ENT	O-	Y	BUG+B	Air	35-37
108	**Buttiauxella warmboldiae**	GN-ENT	O-	Y	BUG+B	Air	35-37
109	**CDC group DF-3 (Capnocytophaga)**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
110	**CDC group EF-4 (Neisseria)**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
111	**CDC group EO-2**	GN-NENT	O+	N	BUG+B	Air	30
112	**CDC group II-E subgroup A**	GN-NENT	O+	N	BUG+B	Air	30
113	**CDC group II-E subgroup B**	GN-NENT	O+	N	BUG+B	Air	30
114	**CDC group II-H**	GN-NENT	O+	N	BUG+B	Air	30
115	**Capnocytophaga canimorsus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
116	**Capnocytophaga cynodegmi**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
117	**Capnocytophaga gingivalis**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
118	**Capnocytophaga granulosa**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
119	**Capnocytophaga haemolytica**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
120	**Capnocytophaga ochracea/sputigena**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
121	**Cardiobacterium hominis**	GN-NENT	O+	N	BUG+B	Air	35-37
122	**Cedecea davisae**	GN-ENT	O-	Y	BUG+B	Air	35-37
123	**Cedecea lapagei**	GN-ENT	O-	Y	BUG+B	Air	35-37
124	**Cedecea neteri**	GN-ENT	O-	Y	BUG+B	Air	35-37
125	**Chromobacterium violaceum**	GN-NENT	O+/-	N	BUG+B	Air	30

†*Agricultural bacteria that may be grown on BUG without blood.*
*** Found in the Dangerous Pathogen database*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
126	**Chryseobacterium balustinum**	GN-NENT	O+	Y	BUG+B	Air	30
127	**Chryseobacterium gleum /indologenes**	GN-NENT	O+	Y	BUG+B	Air	30
128	**Chryseobacterium indoltheticum**	GN-NENT	O+	Y	BUG+B	Air	30
129	**Chryseobacterium meningosepticum**	GN-NENT	O+	N	BUG+B	Air	30
130	**Chryseobacterium scophthalmum**	GN-NENT	O+	N	BUG+B	Air	30
131	**Chryseomonas luteola**	GN-NENT	O-	N	BUG+B	Air	30
132	**Citrobacter amalonaticus**	GN-ENT	O-	Y	BUG+B	Air	35-37
133	**Citrobacter braakii**	GN-ENT	O-	Y	BUG+B	Air	35-37
134	**Citrobacter farmeri**	GN-ENT	O-	Y	BUG+B	Air	35-37
135	**Citrobacter freundii**	GN-ENT	O-	Y	BUG+B	Air	35-37
136	**Citrobacter gillenii**	GN-ENT	O-	Y	BUG+B	Air	35-37
137	**Citrobacter koseri**	GN-ENT	O-	Y	BUG+B	Air	35-37
138	**Citrobacter murliniae**	GN-ENT	O-	Y	BUG+B	Air	35-37
139	**Citrobacter rodentium**	GN-ENT	O-	Y	BUG+B	Air	35-37
140	**Citrobacter sedlakii**	GN-ENT	O-	Y	BUG+B	Air	35-37
141	**Citrobacter werkmanii**	GN-ENT	O-	Y	BUG+B	Air	35-37
142	**Citrobacter youngae**	GN-ENT	O-	Y	BUG+B	Air	35-37
143	**Comamonas terrigena**	GN-NENT	O+	N	BUG+B†	Air	30
144	**Comamonas testosteroni**	GN-NENT	O+	N	BUG+B†	Air	30
145	**Cytophaga fermentans**	GN-NENT	O-	N	BUG+B	Air	30
146	**Delftia acidovorans**	GN-NENT	O+	N	BUG+B†	Air	30
147	**Edwardsiella hoshinae**	GN-ENT	O-	Y	BUG+B	Air	35-37
148	**Edwardsiella ictaluri**	GN-ENT	O-	Y	BUG+B	Air	30
149	**Edwardsiella tarda**	GN-ENT	O-	Y	BUG+B	Air	35-37
150	**Eikenella corrodens**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
151	**Empedobacter brevis**	GN-NENT	O+	N	BUG+B	Air	30
152	**Enterobacter aerogenes (Klebsiella mobilis)**	GN-ENT	O-	Y	BUG+B	Air	35-37
153	**"Enterobacter agglomerans" bgp 2**	GN-ENT	O-	Y	BUG+B	Air	35-37
154	**"Enterobacter agglomerans" bgp 3**	GN-ENT	O-	Y	BUG+B	Air	35-37
155	**"Enterobacter agglomerans" bgp 4 (Pantoea)**	GN-ENT	O-	Y	BUG+B	Air	35-37
156	**"Enterobacter agglomerans" bgp 5**	GN-ENT	O-	Y	BUG+B	Air	35-37
157	**"Enterobacter agglomerans" bgp 6 (Pectobacterium)**	GN-ENT	O-	Y	BUG+B	Air	35-37
158	**"Enterobacter agglomerans" bgp 7 (Pantoea)**	GN-ENT	O-	Y	BUG+B	Air	35-37
159	**Enterobacter amnigenus**	GN-ENT	O-	Y	BUG+B	Air	35-37
160	**Enterobacter asburiae**	GN-ENT	O-	Y	BUG+B	Air	35-37
161	**Enterobacter cancerogenus**	GN-ENT	O-	Y	BUG+B	Air	35-37
162	**Enterobacter cloacae**	GN-ENT	O-	Y	BUG+B	Air	35-37
163	**Enterobacter gergoviae**	GN-ENT	O-	Y	BUG+B	Air	35-37
164	**Enterobacter hormaechei**	GN-ENT	O-	Y	BUG+B	Air	35-37
165	**Enterobacter intermedius**	GN-ENT	O-	Y	BUG+B	Air	35-37
166	**Enterobacter nimipressuralis**	GN-ENT	O-	Y	BUG+B	Air	35-37
167	**Enterobacter sakazakii**	GN-ENT	O-	Y	BUG+B	Air	35-37
168	**Erwinia amylovora**	GN-ENT	O-	Y	BUG+B†	Air	30
169	**Escherichia blattae**	GN-ENT	O-	Y	BUG+B	Air	35-37
170	**Escherichia coli**	GN-ENT	O-	Y	BUG+B	Air	35-37
171	**Escherichia coli (USP5-7085)**	GN-ENT	O-	Y	BUG+B	Air	35-37
172	**Escherichia coli inactive**	GN-ENT	O-	Y	BUG+B	Air	35-37
173	**Escherichia coli O157:H7**	GN-ENT	O-	Y	BUG+B	Air	35-37
174	**Escherichia fergusonii**	GN-ENT	O-	Y	BUG+B	Air	35-37
175	**Escherichia hermannii**	GN-ENT	O-	Y	BUG+B	Air	35-37
176	**Escherichia vulneris**	GN-ENT	O-	Y	BUG+B	Air	35-37
177	**Ewingella americana**	GN-ENT	O-	Y	BUG+B	Air	35-37
178	**Flavimonas oryzihabitans**	GN-NENT	O-	N	BUG+B	Air	30
179	**Flavobacterium ferrugineum**	GN-NENT	O+	N	BUG+B	Air	30
180	**Flavobacterium flevense**	GN-NENT	O+	N	BUG+B	Air	30
181	**Flavobacterium hydatis**	GN-NENT	O+	N	BUG+B	Air	30
182	**Flavobacterium johnsoniae**	GN-NENT	O+	N	BUG+B	Air	30
183	**Flavobacterium mizutaii**	GN-NENT	O+	N	BUG+B	Air	30
184	**Flavobacterium mizutaii-like (CDC group II-I)**	GN-NENT	O+	N	BUG+B	Air	30
185	**Flavobacterium resinovorum**	GN-NENT	O+	N	BUG+B	Air	30
186	**"Flavobacterium tirrenicum" (Chryseobacterium)**	GN-NENT	O+	N	BUG+B	Air	30
187	**Francisella philomiragia**	GN-FAS	O-/+	N	CHOC	6.5%CO2	35-37
188	**Francisella tularensis**	GN-FAS	O-	N	CHOC**	6.5%CO2	35-37
189	**Gilardi unnamed rod group 1**	GN-NENT	O+	N	BUG+B	Air	30
190	**Haemophilus actinomycetemcomitans**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
191	**Haemophilus aegyptius**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
192	**Haemophilus aphrophilus**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
193	**Haemophilus avium (Pasteurella)**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
194	**Haemophilus ducreyi**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
195	**Haemophilus haemoglobinophilus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
196	**Haemophilus haemolyticus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
197	**Haemophilus influenzae**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
198	**Haemophilus paracuniculus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
199	**Haemophilus paragallinarum**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
200	**Haemophilus parahaemolyticus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
201	**Haemophilus parainfluenzae**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
202	**Haemophilus paraphrohaemolyticus**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
203	**Haemophilus paraphrophilus**	GN-FAS	O+/-	Y	CHOC	6.5%CO2	35-37
204	**Haemophilus parasuis**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
205	**Haemophilus segnis**	GN-FAS	O-	Y	CHOC	6.5%CO2	35-37
206	**Haemophilus somnus**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
207	**Hafnia alvei**	GN-ENT	O-	Y	BUG+B	Air	35-37
208	**Herbaspirillum rubrisubalbicans**	GN-NENT	O+	N	BUG+B	Air	30
209	**Herbaspirillum seropedicae**	GN-NENT	O+	N	BUG+B	Air	30
210	**Hydrogenophaga flava**	GN-NENT	O+	N	BUG+B	Air	30
211	**Hydrogenophaga palleronii**	GN-NENT	O+	N	BUG+B	Air	30
212	**Hydrogenophaga pseudoflava**	GN-NENT	O+	N	BUG+B	Air	30
213	**Hydrogenophaga taeniospiralis**	GN-NENT	O+	N	BUG+B	Air	30
214	**Iodobacter fluviatilis**	GN-NENT	O+	N	BUG+B	Air	30
215	**Janthinobacterium lividum**	GN-NENT	O+/-	N	BUG+B	Air	26
216	**Kingella denitirificans**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
217	**Kingella kingae**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
218	**Kingella oralis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
219	**Klebsiella oxytoca**	GN-ENT	O-	Y	BUG+B	Air	35-37
220	**Klebsiella pneumoniae ss ozaenae**	GN-ENT	O-	Y	BUG+B	Air	35-37
221	**Klebsiella pneumoniae ss pneumoniae**	GN-ENT	O-	Y	BUG+B	Air	35-37
222	**Klebsiella pneumoniae ss rhinoscleromatis**	GN-ENT	O-	Y	BUG+B	Air	35-37
223	**Kluyvera ascorbata**	GN-ENT	O-	Y	BUG+B	Air	35-37
224	**Kluyvera cochleae**	GN-ENT	O-	Y	BUG+B	Air	35-37
225	**Kluyvera cryocrescens**	GN-ENT	O-	Y	BUG+B	Air	35-37
226	**Kluyvera georgiana**	GN-ENT	O-	Y	BUG+B	Air	35-37
227	**Lampropedia hyalina**	GN-NENT	O+	N	BUG+B	Air	30
228	**Leclercia adecarboxylata**	GN-ENT	O-	Y	BUG+B	Air	35-37
229	**Leminorella grimontii**	GN-ENT	O-	Y	BUG+B	Air	35-37
230	**Leminorella richardii**	GN-ENT	O-	Y	BUG+B	Air	35-37
231	**Listonella anguillarum**	GN-NENT	O+	N	BUG+B	Air	30
232	**Listonella pelagia**	GN-NENT	O+	N	BUG+B	Air	30
233	**Mannheimia granulomatis**	GN-NENT	O+	N	BUG+B	Air	35-37
234	**Mannheimia haemolytica**	GN-NENT	O+	N	BUG+B	Air	35-37
235	**Moellerella wisconsensis**	GN-ENT	O-	Y	BUG+B	Air	35-37
236	**Moraxella bovis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
237	**Moraxella canis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
238	**Moraxella caprae**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
239	**Moraxella catarrhalis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
240	**Moraxella caviae**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
241	**Moraxella cuniculi**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
242	**Moraxella equi**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
243	**Moraxella lacunata**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
244	**Moraxella nonliquefaciens**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
245	**Moraxella osloensis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
246	**Moraxella ovis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
247	**Morganella morganii ss morganii**	GN-ENT	O-	Y	BUG+B	Air	35-37
248	**Myroides odoratimimus**	GN-NENT	O+	N	BUG+B	Air	30
249	**Myroides odoratus**	GN-NENT	O+	N	BUG+B	Air	30
250	**Neisseria animalis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
251	**Neisseria canis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
252	**Neisseria cinerea**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
253	**Neisseria denitrificans**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
254	**Neisseria elongata ss elongata**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
255	**Neisseria flava**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
256	**Neisseria flavescens**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
257	**Neisseria gonorrhoeae**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
258	**Neisseria lactamica**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
259	**Neisseria meningitidis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
260	**Neisseria mucosa**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
261	**Neisseria perflava**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
262	**Neisseria sicca**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
263	**Neisseria subflava**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
264	**Neisseria weaveri**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
265	**Obesumbacterium proteus**	GN-ENT	O-	Y	BUG+B	Air	35-37
266	**Obesumbacterium proteus biogroup 2**	GN-ENT	O-	Y	BUG+B	Air	35-37
267	**Oceanomonas doudoroffii**	GN-NENT	O+	N	BUG+B†	Air	30
268	**Ochrobactrum anthropi**	GN-NENT	O+	N	BUG+B	Air	30
269	**Oligella ureolytica**	GN-NENT	O+	N	BUG+B	Air	35-37
270	**Oligella urethralis**	GN-NENT	O+	N	BUG+B	Air	35-37
271	**Ornithobacterium rhinotracheale**	GN-NENT	O+	N	BUG+B	Air	30
272	**Pandoraea norimbergensis**	GN-NENT	O+	N	BUG+B†	Air	30
273	**Pantoea agglomerans**	GN-ENT	O-	Y	BUG+B	Air	35-37
274	**Pantoea citrea**	GN-ENT	O-	Y	BUG+B	Air	35-37
275	**Pantoea dispersa**	GN-ENT	O-	Y	BUG+B	Air	35-37
276	**Pantoea punctata**	GN-ENT	O-	Y	BUG+B	Air	35-37
277	**Pantoea stewartii ss stewartii**	GN-ENT	O-	Y	BUG+B	Air	35-37
278	**Pantoea terrea**	GN-ENT	O-	Y	BUG+B	Air	35-37
279	**"Pasteurella" aerogenes**	GN-NENT	O+/-	N	BUG+B	Air	35-37
280	**Pasteurella anatis**	GN-NENT	O+/-	N	BUG+B	Air	35-37
281	**Pasteurella bettyae**	GN-NENT	O-	N	BUG+B	Air	35-37
282	**Pasteurella caballi**	GN-NENT	O+	N	BUG+B	Air	35-37
283	**Pasteurella canis/stomatis**	GN-NENT	O+	N	BUG+B	Air	35-37
284	**Pasteurella dagmatis**	GN-NENT	O+	N	BUG+B	Air	35-37
285	**Pasteurella gallinarum**	GN-NENT	O+	N	BUG+B	Air	35-37
286	**Pasteurella langaaensis**	GN-NENT	O+/-	N	BUG+B	Air	35-37
287	**Pasteurella lymphangitidis**	GN-NENT	O-	N	BUG+B	Air	30
288	**Pasteurella mairii**	GN-NENT	O+	N	BUG+B	Air	30
289	**Pasteurella multocida ss multocida**	GN-NENT	O+	N	BUG+B	Air	35-37
290	**Pasteurella pneumotropica**	GN-NENT	O+	N	BUG+B	Air	35-37
291	**"Pasteurella" testudinis**	GN-NENT	O+	N	BUG+B	Air	30
292	**Pasteurella trehalosi**	GN-NENT	O+	N	BUG+B	Air	30
293	**Pasteurella volantium**	GN-NENT	O+	N	BUG+B	Air	35-37
294	**Paucimonas lemoignei**	GN-NENT	O+	N	BUG+B†	Air	30
295	**Pectobacterium carotovorum ss atrosepticum**	GN-ENT	O-	Y	BUG+B†	Air	35-37
296	**Pectobacterium carotovorum ss betavasculorum**	GN-ENT	O-	Y	BUG+B†	Air	35-37
297	**Pectobacterium carotovorum ss carotovorum**	GN-ENT	O-	Y	BUG+B†	Air	35-37
298	**Pectobacterium chrysanthemi**	GN-ENT	O-	Y	BUG+B†	Air	35-37
299	**Pectobacterium cypripedii**	GN-ENT	O-	Y	BUG+B†	Air	35-37
300	**Pedobacter heparinus**	GN-NENT	O+	N	BUG+B	Air	30
301	**Photobacterium angustum**	GN-NENT	O+	N	BUG+B	Air	30
302	**Photobacterium damsela ss damselae**	GN-NENT	O+	N	BUG+B	Air	30
303	**Photobacterium fischeri**	GN-NENT	O+	N	BUG+B	Air	30
304	**Photobacterium leiognathi**	GN-NENT	O+	N	BUG+B	Air	30
305	**Photorhabdus luminescens ss luminescens**	GN-ENT	O-	N	BUG+B	Air	30
306	**Phyllobacterium myrsinacearum**	GN-NENT	O+	N	BUG+B	Air	30
307	**Phyllobacterium rubiacearum**	GN-NENT	O+	N	BUG+B	Air	30
308	**Plesiomonas shigelloides**	GN-NENT	O+	N	BUG+B	Air	30
309	**Pragia fontium**	GN-ENT	O-	Y	BUG+B	Air	35-37
310	**Proteus mirabilis**	GN-ENT	O-	Y	BUG+B	Air	35-37
311	**Proteus myxofaciens**	GN-ENT	O-	Y	BUG+B	Air	35-37
312	**Proteus penneri/vulgaris**	GN-ENT	O-	Y	BUG+B	Air	35-37
313	**Providencia alcalifaciens**	GN-ENT	O-	Y	BUG+B	Air	35-37
314	**Providencia heimbachae**	GN-ENT	O-	Y	BUG+B	Air	35-37
315	**Providencia rettgeri**	GN-ENT	O-	Y	BUG+B	Air	35-37
316	**Providencia rustigianii**	GN-ENT	O-	Y	BUG+B	Air	35-37
317	**Providencia stuartii**	GN-ENT	O-	Y	BUG+B	Air	35-37
318	**Pseudomonas aeruginosa**	GN-NENT	O+	N	BUG+B†	Air	30
319	**Pseudomonas agarici**	GN-NENT	O+	N	BUG+B†	Air	30
320	**Pseudomonas alcaligenes**	GN-NENT	O+/-	N	BUG+B†	Air	30
321	**Pseudomonas asplenii**	GN-NENT	O+	N	BUG+B†	Air	30
322	**Pseudomonas aurantiaca**	GN-NENT	O+	N	BUG+B†	Air	30
323	**"Pseudomonas bathycetes"**	GN-NENT	O+	N	BUG+B†	Air	30
324	**"Pseudomonas" boreopolis (Stenotrophomonas)**	GN-NENT	O+	N	BUG+B†	Air	30
325	**Pseudomonas caricapapayae (syringae)**	GN-NENT	O-	N	BUG+B†	Air	30
326	**Pseudomonas chlororaphis**	GN-NENT	O+	N	BUG+B†	Air	30
327	**Pseudomonas cichorii (syringae)**	GN-NENT	O-	N	BUG+B†	Air	30
328	**"Pseudomonas" cissicola (Xanthomonas-like)**	GN-NENT	O-	N	BUG+B†	Air	30
329	**Pseudomonas citronellolis**	GN-NENT	O+	N	BUG+B†	Air	30

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
330	**Pseudomonas corrugata**	GN-NENT	O+	N	BUG+B†	Air	30
331	**"Pseudomonas floridana" (Burkholderia-like)**	GN-NENT	O+	N	BUG+B†	Air	30
332	**Pseudomonas fluorescens**	GN-NENT	O+/-	N	BUG+B†	Air	30
333	**Pseudomonas fluorescens biotype A**	GN-NENT	O+/-	N	BUG+B†	Air	30
334	**Pseudomonas fluorescens biotype C**	GN-NENT	O+/-	N	BUG+B†	Air	30
335	**Pseudomonas fluorescens biotype F**	GN-NENT	O+/-	N	BUG+B†	Air	30
336	**Pseudomonas fluorescens biotype G**	GN-NENT	O+/-	N	BUG+B†	Air	30
337	**Pseudomonas fragi**	GN-NENT	O+	N	BUG+B†	Air	30
338	**Pseudomonas fulva**	GN-NENT	O+	N	BUG+B†	Air	30
339	**Pseudomonas fuscovaginae**	GN-NENT	O+	N	BUG+B†	Air	30
340	**"Pseudomonas group 2" (Burkholderia-like)**	GN-NENT	O+	N	BUG+B†	Air	30
341	**"Pseudomonas" huttiensis (Burkholderia-like)**	GN-NENT	O+	N	BUG+B†	Air	30
342	**Pseudomonas lundensis**	GN-NENT	O+	N	BUG+B†	Air	30
343	**Pseudomonas "maculicola"**	GN-NENT	O+	N	BUG+B†	Air	30
344	**Pseudomonas marginalis**	GN-NENT	O+	N	BUG+B†	Air	30
345	**Pseudomonas mendocina**	GN-NENT	O+	N	BUG+B†	Air	30
346	**"Pseudomonas mephitica"**	GN-NENT	O+	N	BUG+B†	Air	30
347	**Pseudomonas mucidolens**	GN-NENT	O+	N	BUG+B†	Air	30
348	**Pseudomonas nitroreducens/azelaica**	GN-NENT	O+	N	BUG+B†	Air	30
349	**Pseudomonas oleovorans**	GN-NENT	O+	N	BUG+B†	Air	30
350	**Pseudomonas pertucinogena**	GN-NENT	O+	N	BUG+B†	Air	30
351	**Pseudomonas pseudoalcaligenes ss pseudoalcaligenes**	GN-NENT	O+	N	BUG+B†	Air	30
352	**Pseudomonas putida**	GN-NENT	O+	N	BUG+B†	Air	30
353	**Pseudomonas putida biotype A**	GN-NENT	O+	N	BUG+B†	Air	30
354	**Pseudomonas putida biotype B**	GN-NENT	O+	N	BUG+B†	Air	30
355	**Pseudomonas resinovorans**	GN-NENT	O+	N	BUG+B†	Air	30
356	**Pseudomonas savastanoi pv fraxini**	GN-NENT	O-	N	BUG+B†	Air	30
357	**Pseudomonas savastanoi pv glycinea**	GN-NENT	O-	N	BUG+B†	Air	30
358	**Pseudomonas savastanoi pv nerii**	GN-NENT	O-	N	BUG+B†	Air	30
359	**Pseudomonas spinosa (Burkholderia)**	GN-NENT	O+	N	BUG+B†	Air	30
360	**Pseudomonas straminea**	GN-NENT	O+	N	BUG+B†	Air	30
361	**Pseudomonas stutzeri**	GN-NENT	O+	N	BUG+B†	Air	30
362	**Pseudomonas synxantha**	GN-NENT	O+	N	BUG+B†	Air	30
363	**Pseudomonas syringae pv aceris**	GN-NENT	O-	N	BUG+B†	Air	30
364	**Pseudomonas syringae pv antirrhini**	GN-NENT	O-	N	BUG+B†	Air	30
365	**Pseudomonas syringae pv apii**	GN-NENT	O-	N	BUG+B†	Air	30
366	**Pseudomonas syringae pv aptata**	GN-NENT	O-	N	BUG+B†	Air	30
367	**Pseudomonas syringae pv atrofaciens**	GN-NENT	O-	N	BUG+B†	Air	30
368	**Pseudomonas syringae pv coronafaciens**	GN-NENT	O-	N	BUG+B†	Air	30
369	**Pseudomonas syringae pv cunninghamiae**	GN-NENT	O-	N	BUG+B†	Air	30
370	**Pseudomonas syringae pv delphinii**	GN-NENT	O-	N	BUG+B†	Air	30
371	**Pseudomonas syringae pv eriobotryae**	GN-NENT	O-	N	BUG+B†	Air	30
372	**Pseudomonas syringae pv glycinea**	GN-NENT	O-	N	BUG+B†	Air	30
373	**Pseudomonas syringae pv helianthi**	GN-NENT	O-	N	BUG+B†	Air	30
374	**Pseudomonas syringae pv lachrymans**	GN-NENT	O-	N	BUG+B†	Air	30
375	**Pseudomonas syringae pv mori**	GN-NENT	O-	N	BUG+B†	Air	30
376	**Pseudomonas syringae pv myricae**	GN-NENT	O-	N	BUG+B†	Air	30
377	**Pseudomonas syringae pv oryzae**	GN-NENT	O-	N	BUG+B†	Air	30
378	**Pseudomonas syringae pv papulans**	GN-NENT	O-	N	BUG+B†	Air	30
379	**Pseudomonas syringae pv persicae**	GN-NENT	O-	N	BUG+B†	Air	30
380	**Pseudomonas syringae pv phaseolicola**	GN-NENT	O-	N	BUG+B†	Air	30
381	**Pseudomonas syringae pv pisi**	GN-NENT	O-	N	BUG+B†	Air	30
382	**Pseudomonas syringae pv porri**	GN-NENT	O-	N	BUG+B†	Air	30
383	**Pseudomonas syringae pv primulae**	GN-NENT	O-	N	BUG+B†	Air	30
384	**Pseudomonas syringae pv sesami**	GN-NENT	O-	N	BUG+B†	Air	30
385	**Pseudomonas syringae pv syringae**	GN-NENT	O-	N	BUG+B†	Air	30
386	**Pseudomonas syringae pv tabaci A**	GN-NENT	O-	N	BUG+B†	Air	30
387	**Pseudomonas syringae pv tabaci B**	GN-NENT	O-	N	BUG+B†	Air	30
388	**Pseudomonas syringae pv tagetis**	GN-NENT	O-	N	BUG+B†	Air	30
389	**Pseudomonas syringae pv tomato**	GN-NENT	O-	N	BUG+B†	Air	30
390	**Pseudomonas syringae pv zinaniae**	GN-NENT	O-	N	BUG+B†	Air	30
391	**Pseudomonas taetrolens**	GN-NENT	O+	N	BUG+B†	Air	30
392	**Pseudomonas tolaasii**	GN-NENT	O+	N	BUG+B†	Air	30
393	**Pseudomonas viridiflava (syringae)**	GN-NENT	O-	N	BUG+B†	Air	30
394	**Pseudomonas viridilivida**	GN-NENT	O-	N	BUG+B†	Air	30
395	**Psychrobacter immobilis**	GN-NENT	O+	N	BUG+B	Air	30
396	**Psychrobacter phenylpyruvicus**	GN-NENT	O+	Y	BUG+B	Air	35-37
397	**Rahnella aquatilis**	GN-ENT	O-	Y	BUG+B	Air	35-37

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*** Found in the Dangerous Pathogen database*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
398	**Ralstonia eutropha**	GN-NENT	O+	N	BUG+B	Air	30
399	**Ralstonia paucula**	GN-NENT	O+	N	BUG+B	Air	30
400	**Ralstonia pickettii**	GN-NENT	O+	N	BUG+B	Air	30
401	**Ralstonia solanacearum**	GN-NENT	O+	N	BUG+B	Air	30
402	**Raoultella planticola**	GN-ENT	O-	Y	BUG+B	Air	35-37
403	**Raoultella planticola/ornithinolytica**	GN-ENT	O-	Y	BUG+B	Air	35-37
404	**Raoultella terrigena**	GN-ENT	O-	Y	BUG+B	Air	35-37
405	**Rhizobium like-Cystic Fibrosis**	GN-NENT	O+	N	BUG+B†	Air	35-37
406	**Rhizobium radiobacter**	GN-NENT	O+/-	N	BUG+B†	Air	30
407	**Rhizobium rhizogenes**	GN-NENT	O+/-	N	BUG+B†	Air	30
408	**Rhizobium vitis**	GN-NENT	O+/-	N	BUG+B†	Air	30
409	**Riemerella anatipestifer**	GN-NENT	O+	N	BUG+B	Air	35-37
410	**Roseomonas cervicalis**	GN-NENT	O+	N	BUG+B	Air	30
411	**Roseomonas fauriae**	GN-NENT	O+	N	BUG+B	Air	30
412	**Roseomonas genomospecies 4**	GN-NENT	O+	N	BUG+B	Air	30
413	**Roseomonas genomospecies 5**	GN-NENT	O+	N	BUG+B	Air	30
414	**Roseomonas genomospecies 6**	GN-NENT	O+	N	BUG+B	Air	30
415	**Roseomonas gilardii**	GN-NENT	O+	N	BUG+B	Air	30
416	**Salmonella gp 1 (choleraesuis)**	GN-ENT	O-	Y	BUG+B	Air	35-37
417	**Salmonella gp 1 (choleraesuis) st choleraesuis**	GN-ENT	O-	Y	BUG+B	Air	35-37
418	**Salmonella gp 1 (choleraesuis) st gallinarum**	GN-ENT	O-	Y	BUG+B	Air	35-37
419	**Salmonella gp 1 (choleraesuis) st paratyphi A**	GN-ENT	O-	Y	BUG+B	Air	35-37
420	**Salmonella gp 1 (choleraesuis) st pullorum**	GN-ENT	O-	Y	BUG+B	Air	35-37
421	**Salmonella gp 1 (choleraesuis) st typhi**	GN-ENT	O-	Y	BUG+B	Air	35-37
422	**Salmonella gp 1 (choleraesuis) st typhimurium**	GN-ENT	O-	Y	BUG+B	Air	35-37
423	**Salmonella gp 3a (arizonae)**	GN-ENT	O-	Y	BUG+B	Air	35-37
424	**Salmonella gp 3b (diarizonae)**	GN-ENT	O-	Y	BUG+B	Air	35-37
425	**Salmonella gp 4 (houtenae)**	GN-ENT	O-	Y	BUG+B	Air	35-37
426	**Salmonella gp 5 (bongori)**	GN-ENT	O-	Y	BUG+B	Air	35-37
427	**Salmonella gp 6 (indica)**	GN-ENT	O-	Y	BUG+B	Air	35-37
428	**Serpens flexibilis**	GN-NENT	O+	N	BUG+B	Air	30
429	**Serratia entomophila**	GN-ENT	O-	Y	BUG+B	Air	35-37
430	**Serratia ficaria**	GN-ENT	O-/v	Y	BUG+B	Air	35-37
431	**Serratia fonticola**	GN-ENT	O-	Y	BUG+B	Air	35-37
432	**Serratia liquefaciens/grimesii**	GN-ENT	O-	Y	BUG+B	Air	35-37
433	**Serratia marcescens**	GN-ENT	O-	Y	BUG+B	Air	35-37
434	**Serratia odorifera**	GN-ENT	O-	Y	BUG+B	Air	35-37
435	**Serratia plymuthica**	GN-ENT	O-	Y	BUG+B	Air	35-37
436	**Serratia proteamaculans ss proteamaculans**	GN-ENT	O-	Y	BUG+B	Air	35-37
437	**Serratia rubidaea**	GN-ENT	O-	Y	BUG+B	Air	35-37
438	**Shewanella algae**	GN-NENT	O+	N	BUG+B	Air	30
439	**Shewanella putrefaciens A**	GN-NENT	O+	N	BUG+B	Air	30
440	**Shewanella putrefaciens B**	GN-NENT	O+	N	BUG+B	Air	30
441	**Shigella boydii**	GN-ENT	O-	Y	BUG+B	Air	35-37
442	**Shigella dysenteriae**	GN-ENT	O-	Y	BUG+B	Air	35-37
443	**Shigella flexneri**	GN-ENT	O-	Y	BUG+B	Air	35-37
444	**Shigella sonnei**	GN-ENT	O-	Y	BUG+B	Air	35-37
445	**Simonsiella crassa**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
446	**Simonsiella muelleri**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
447	**Simonsiella steedae**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
448	**Sinorhizobium meliloti**	GN-NENT	O+	N	BUG+B	Air	30
449	**Sphingobacterium multivorum**	GN-NENT	O+	N	BUG+B	Air	30
450	**Sphingobacterium multivorum-like**	GN-NENT	O+	N	BUG+B	Air	30
451	**Sphingobacterium spiritivorum**	GN-NENT	O+	N	BUG+B	Air	30
452	**Sphingobacterium thalpophilum**	GN-NENT	O+	N	BUG+B	Air	30
453	**Sphingomonas adhaesiva**	GN-NENT	O+/-	N	BUG+B	Air	30
454	**Sphingomonas capsulata**	GN-NENT	O+/-	N	BUG+B	Air	30
455	**Sphingomonas echinoides**	GN-NENT	O+	N	BUG+B†	Air	30
456	**Sphingomonas macrogoltabidus**	GN-NENT	O+/-	N	BUG+B	Air	30
457	**Sphingomonas parapaucimobilis**	GN-NENT	O+/-	N	BUG+B	Air	30
458	**Sphingomonas paucimobilis A**	GN-NENT	O+/-	N	BUG+B	Air	30
459	**Sphingomonas paucimobilis B**	GN-NENT	O+/-	N	BUG+B	Air	30
460	**Sphingomonas sanguinis**	GN-NENT	O+/-	N	BUG+B	Air	30
461	**Sphingomonas terrae**	GN-NENT	O+/-	N	BUG+B	Air	30
462	**Sphingomonas yanoikuyae**	GN-NENT	O+/-	N	BUG+B	Air	30
463	**Stenotrophomonas maltophilia**	GN-NENT	O-	N	BUG+B†	Air	30
464	**Suttonella indologenes**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
465	**Tatumella ptyseos**	GN-ENT	O-	Y	BUG+B	Air	35-37

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
466	**Taylorella equigenitalis**	GN-FAS	O+	Y	CHOC	6.5%CO2	35-37
467	**Trabulsiella guamensis**	GN-ENT	O-	Y	BUG+B	Air	35-37
468	**Variovorax paradoxus**	GN-NENT	O+	N	BUG+B	Air	30
469	**Vibrio aestuarianus**	GN-NENT	O+	N	BUG+B	Air	30
470	**Vibrio alginolyticus**	GN-NENT	O+	N	BUG+B†	Air	30
471	**Vibrio campbelli**	GN-NENT	O+	N	BUG+B	Air	30
472	**Vibrio carchariae**	GN-NENT	O+	N	BUG+B	Air	30
473	**Vibrio cholerae O1 (ATCC 25870)**	GN-NENT	O+	N	BUG+B	Air	30
474	**Vibrio cholerae O1/0139**	GN-NENT	O+	N	BUG+B	Air	30
475	**Vibrio cholerae non O1**	GN-NENT	O+	N	BUG+B	Air	30
476	**Vibrio cincinnatiensis**	GN-NENT	O+	N	BUG+B	Air	30
477	**Vibrio diazotrophicus**	GN-NENT	O+	N	BUG+B	Air	30
478	**Vibrio fluvialis**	GN-NENT	O+	N	BUG+B	Air	30
479	**Vibrio furnissii**	GN-NENT	O+	N	BUG+B	Air	30
480	**Vibrio harveyi**	GN-NENT	O+	N	BUG+B	Air	30
481	**Vibrio mediterranei**	GN-NENT	O+	N	BUG+B	Air	30
482	**Vibrio metschnikovii**	GN-NENT	O-	N	BUG+B	Air	30
483	**Vibrio mimicus**	GN-NENT	O+	N	BUG+B	Air	30
484	**Vibrio natriegens**	GN-NENT	O+	N	BUG+B	Air	30
485	**Vibrio ordalii**	GN-NENT	O+	N	BUG+B	Air	30
486	**Vibrio parahaemolyticus**	GN-NENT	O+	N	BUG+B	Air	30
487	**Vibrio proteolyticus**	GN-NENT	O+	N	BUG+B	Air	30
488	**Vibrio splendidus**	GN-NENT	O+	N	BUG+B	Air	26
489	**Vibrio tubiashii**	GN-NENT	O+	N	BUG+B	Air	30
490	**Vibrio vulnificus**	GN-NENT	O+	N	BUG+B	Air	30
491	**Vogesella indigofera**	GN-NENT	O+	N	BUG+B	Air	30
492	**Weeksella virosa**	GN-NENT	O+	N	BUG+B	Air	30
493	**Xanthomonas albilineans**	GN-NENT	O-	N	BUG	Air	30
494	**Xanthomonas campestris pv begoniae A**	GN-NENT	O-	N	BUG	Air	30
495	**Xanthomonas campestris pv begoniae B**	GN-NENT	O-	N	BUG	Air	30
496	**Xanthomonas campestris pv campestris**	GN-NENT	O-	N	BUG	Air	30
497	**Xanthomonas campestris pv carotae**	GN-NENT	O-	N	BUG	Air	30
498	**Xanthomonas campestris pv dieffenbachiae**	GN-NENT	O-	N	BUG	Air	30
499	**Xanthomonas campestris pv hyacinthi**	GN-NENT	O-	N	BUG	Air	30
500	**Xanthomonas campestris pv juglandis**	GN-NENT	O-	N	BUG	Air	30
501	**Xanthomonas campestris pv malvacearum**	GN-NENT	O-	N	BUG	Air	30
502	**Xanthomonas campestris pv nigromaculans**	GN-NENT	O-	N	BUG	Air	30
503	**Xanthomonas campestris pv pelargonii**	GN-NENT	O-	N	BUG	Air	30
504	**Xanthomonas campestris pv phaseoli**	GN-NENT	O-	N	BUG	Air	30
505	**Xanthomonas campestris pv poinsettiicola**	GN-NENT	O-	N	BUG	Air	30
506	**Xanthomonas campestris pv raphani**	GN-NENT	O-	N	BUG	Air	30
507	**Xanthomonas campestris pv tardicrescens**	GN-NENT	O-	N	BUG	Air	30
508	**Xanthomonas campestris pv translucens**	GN-NENT	O-	N	BUG	Air	30
509	**Xanthomonas campestris pv vesicatoria**	GN-NENT	O-	N	BUG	Air	30
510	**Xanthomonas oryzae pv oryzicola**	GN-NENT	O-	N	BUG	Air	30
511	**Xenorhabdus bovienii**	GN-ENT	O-	N	BUG+B	Air	30
512	**Xenorhabdus nematophila**	GN-ENT	O-	N	BUG+B	Air	30
513	**Yersinia aldovae**	GN-ENT	O-	Y	BUG+B	Air	35-37
514	**Yersinia bercovieri**	GN-ENT	O-	Y	BUG+B	Air	35-37
515	**Yersinia enterocolitica ss enterocolitica**	GN-ENT	O-	Y	BUG+B	Air	35-37
516	**Yersinia fredericksenii**	GN-ENT	O-	Y	BUG+B	Air	35-37
517	**Yersinia intermedia**	GN-ENT	O-	Y	BUG+B	Air	35-37
518	**Yersinia kristensenii**	GN-ENT	O-	Y	BUG+B	Air	35-37
519	**Yersinia mollaretii**	GN-ENT	O-	Y	BUG+B	Air	35-37
520	**Yersinia pestis**	GN-ENT	O-	N	BUG+B**	Air	35-37
521	**Yersinia pseudotuberculosis**	GN-ENT	O-	Y	BUG+B	Air	35-37
522	**Yersinia rohdei**	GN-ENT	O-	Y	BUG+B	Air	35-37
523	**Yersinia ruckeri**	GN-ENT	O-	Y	BUG+B	Air	35-37
524	**Yokenella regensburgei**	GN-ENT	O-	Y	BUG+B	Air	35-37

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Gram-Positive Aerobic Bacteria

	Species Name	Type	Test	Thio	Medium	Atm	Temp
1	**Actinomyces bovis**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
2	**Actinomyces canis**	GP-ROD	C+/-	Y	BUG+B	6.5%CO2	35-37
3	**Actinomyces hordeovulneris**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
4	**Actinomyces hyovaginalis**	GP-ROD	C-/W+	Y	BUG+B	6.5%CO2	35-37
5	**Actinomyces naeslundii**	GP-ROD	C-/W+	Y	BUG+B	6.5%CO2	35-37
6	**Actinomyces neuii ss anitratus**	GP-ROD	C+/-	Y	BUG+B	6.5%CO2	35-37
7	**Actinomyces neuii ss neuii**	GP-ROD	C+/-	Y	BUG+B	6.5%CO2	35-37
8	**Actinomyces odontolyticus**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
9	**Actinomyces radingae/turicensis (CDC.E)**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
10	**Actinomyces viscosus**	GP-ROD	C+	Y	BUG+B	6.5%CO2	35-37
11	**Aerococcus christensenii**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
12	**Aerococcus urinae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
13	**Aerococcus viridans**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
14	**Alloiococcus otitis**	GP-COCCUS	C-/W+	Y	BUG+B	6.5%CO2	35-37
15	**Arcanobacterium bernardiae (CDC.2)**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
16	**Arcanobacterium haemolyticum**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
17	**Arcanobacterium pyogenes**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
18	**Arthrobacter cumminsii**	GP-ROD	C+	Y	BUG+B	Air	30
19	**Arthrobacter histidinolovorans**	GP-ROD	C+	Y	BUG+B	Air	30
20	**Arthrobacter ilicis**	GP-ROD	C+	Y	BUG+B	Air	30
21	**Arthrobacter woluwensis**	GP-ROD	C+	Y	BUG+B	Air	30
22	**Aureobacterium resistens**	GP-ROD	C+	Y	BUG+B	Air	35-37
23	**Bacillus alcalophilus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
24	**Bacillus amyloliquefaciens A**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
25	**Bacillus amyloliquefaciens B**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
26	**Bacillus anthracis subgroup A**	GP-ROD SB	C-/W+	N	BUG+M**	Air	30
27	**Bacillus anthracis subgroup B**	GP-ROD SB	C-/W+	N	BUG+M**	Air	30
28	**Bacillus anthracis subgroup C**	GP-ROD SB	C-/W+	N	BUG+M**	Air	30
29	**Bacillus anthracis subgroup D**	GP-ROD SB	C-/W+	N	BUG+M**	Air	30
30	**Bacillus badius**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
31	**Bacillus cereus/thuringiensis A**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
32	**Bacillus cereus/thuringiensis B**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
33	**Bacillus cereus/thuringiensis C**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
34	**Bacillus circulans**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
35	**Bacillus coagulans**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
36	**Bacillus fastidiosus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
37	**Bacillus firmus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
38	**Bacillus halodurans**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
39	**Bacillus laevolacticus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
40	**Bacillus licheniformis**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
41	**Bacillus maroccanus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
42	**Bacillus megaterium A**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
43	**Bacillus megaterium B**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
44	**Bacillus mycoides**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
45	**Bacillus psychrosaccharolyticus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
46	**Bacillus pumilus A**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
47	**Bacillus pumilus B**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
48	**Bacillus pumilus C**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
49	**Bacillus racemilacticus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
50	**Bacillus sphaericus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
51	**Bacillus subtilis A**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
52	**Bacillus subtilis B**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
53	**Bacillus subtilis C**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
54	**Brevibacillus brevis**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
55	**Brevibacterium casei**	GP-ROD	C+	Y	BUG+B	Air	35-37
56	**Brevibacterium epidermidis**	GP-ROD	C+	Y	BUG+B	Air	35-37
57	**Brevibacterium linens**	GP-ROD	C+	Y	BUG+B	Air	35-37
58	**Brevibacterium liquifaciens**	GP-ROD	C+	Y	BUG+B	Air	35-37
59	**Brevibacterium mcbrellneri**	GP-ROD	C+	Y	BUG+B	Air	35-37
60	**Brevibacterium otitidis**	GP-ROD	C+	Y	BUG+B	Air	35-37
61	**Brochothrix campestris**	GP-ROD	C+	Y	BUG+B	6.5%CO2	35-37
62	**Brochothrix thermosphacta**	GP-ROD	C+	Y	BUG+B	Air	30
63	**Carnobacterium alterfunditum**	GP-ROD	C-	Y	BUG+B	Air	26
64	**Carnobacterium divergens**	GP-ROD	C-	Y	BUG+B	Air	26

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
65	**Carnobacterium gallinarum**	GP-ROD	C-	Y	BUG+B	Air	26
66	**Carnobacterium mobile**	GP-ROD	C-	Y	BUG+B	Air	26
67	**Carnobacterium piscicola**	GP-ROD	C-	Y	BUG+B	Air	26
68	**Cellulomonas biazotea**	GP-ROD	C+	Y	BUG+B	Air	35-37
69	**Cellulomonas cellasea**	GP-ROD	C+	Y	BUG+B	Air	30
70	**Cellulomonas fimi**	GP-ROD	C+	Y	BUG+B	Air	35-37
71	**Cellulomonas flavigena**	GP-ROD	C+	Y	BUG+B	Air	35-37
72	**Cellulomonas gelida**	GP-ROD	C+	Y	BUG+B	Air	35-37
73	**Cellulomonas hominis (CDC.A-3)**	GP-ROD	C+	Y	BUG+B	Air	35-37
74	**Cellulomonas turbata (Oerskovia turbata)**	GP-ROD	C+	Y	BUG+B	Air	35-37
75	**Cellulomonas uda**	GP-ROD	C+	Y	BUG+B	Air	35-37
76	**Cellulosimicrobium cellulans**	GP-ROD	C+	Y	BUG+B	Air	35-37
77	**Clavibacter agropyri (Corynebacterium)**	GP-ROD	C+	N	BUG	Air	30
78	**Clavibacter michiganensis ss insidiosus**	GP-ROD	C+	N	BUG	Air	30
79	**Clavibacter michiganensis ss michiganensis**	GP-ROD	C+	N	BUG	Air	30
80	**Clavibacter michiganensis ss nebraskensis**	GP-ROD	C+	N	BUG	Air	30
81	**Clavibacter michiganensis ss sepedonicus**	GP-ROD	C+	N	BUG	Air	30
82	**Clavibacter michiganensis ss tessellarius**	GP-ROD	C+	N	BUG	Air	30
83	**Corynebacterium accolens**	GP-ROD	C+	Y	BUG+B	Air	35-37
84	**Corynebacterium afermentans ss afermentans(CDC.ANF-1)**	GP-ROD	C+	Y	BUG+B	Air	35-37
85	**Corynebacterium afermentans ss lipophilum**	GP-ROD	C+	Y	BUG+B	Air	35-37
86	**"Corynebacterium" ammoniagenes (Brevibacterium-like)**	GP-ROD	C+	Y	BUG+B	Air	35-37
87	**Corynebacterium amycolatum (CDC.F-2)**	GP-ROD	C+	Y	BUG+B	Air	35-37
88	**Corynebacterium argentoratense**	GP-ROD	C+	Y	BUG+B	Air	35-37
89	**Corynebacterium auris**	GP-ROD	C+	Y	BUG+B	Air	35-37
90	**Corynebacterium bovis**	GP-ROD	C+	Y	BUG+B	Air	35-37
91	**Corynebacterium callunae**	GP-ROD	C+	Y	BUG+B	Air	35-37
92	**Corynebacterium camporrealensis**	GP-ROD	C+	Y	BUG+B	Air	35-37
93	**Corynebacterium coyleae**	GP-ROD	C+	Y	BUG+B	Air	35-37
94	**Corynebacterium cystitidis**	GP-ROD	C+	Y	BUG+B	Air	35-37
95	**Corynebacterium diphtheriae**	GP-ROD	C+	Y	BUG+B	Air	35-37
96	**Corynebacterium durum**	GP-ROD	C+	Y	BUG+B	Air	35-37
97	**Corynebacterium falsenii**	GP-ROD	C+	Y	BUG+B	Air	35-37
98	**Corynebacterium flavescens**	GP-ROD	C+	Y	BUG+B	Air	35-37
99	**Corynebacterium glucuronolyticum**	GP-ROD	C+	Y	BUG+B	Air	35-37
100	**Corynebacterium glutamicum**	GP-ROD	C+	Y	BUG+B	Air	35-37
101	**Corynebacterium imitans**	GP-ROD	C+	Y	BUG+B	Air	35-37
102	**Corynebacterium jeikeium**	GP-ROD	C+	Y	BUG+B	Air	35-37
103	**Corynebacterium kutscheri**	GP-ROD	C+	Y	BUG+B	Air	35-37
104	**Corynebacterium lipophiloflavum**	GP-ROD	C+	Y	BUG+B	Air	35-37
105	**Corynebacterium macginleyi**	GP-ROD	C+	Y	BUG+B	Air	35-37
106	**Corynebacterium mastitidis**	GP-ROD	C+	Y	BUG+B	Air	35-37
107	**Corynebacterium matruchotii**	GP-ROD	C+	Y	BUG+B	Air	35-37
108	**Corynebacterium minutissimum**	GP-ROD	C+	Y	BUG+B	Air	35-37
109	**Corynebacterium mucifaciens**	GP-ROD	C+	Y	BUG+B	Air	35-37
110	**Corynebacterium mycetoides**	GP-ROD	C+	Y	BUG+B	Air	35-37
111	**"Corynebacterium nitrilophilus"**	GP-ROD	C+	Y	BUG+B	Air	35-37
112	**Corynebacterium pilosum**	GP-ROD	C+	Y	BUG+B	Air	35-37
113	**Corynebacterium pseudodiphtheriticum/propinquum(CDC.ANF-3)**	GP-ROD	C+	Y	BUG+B	Air	35-37
114	**Corynebacterium pseudotuberculosis**	GP-ROD	C+	Y	BUG+B	Air	35-37
115	**Corynebacterium renale**	GP-ROD	C+	Y	BUG+B	Air	35-37
116	**Corynebacterium riegelii**	GP-ROD	C+	Y	BUG+B	Air	35-37
117	**Corynebacterium seminale**	GP-ROD	C+	Y	BUG+B	Air	35-37
118	**Corynebacterium singulare**	GP-ROD	C+	Y	BUG+B	Air	35-37
119	**Corynebacterium spp. (CDC.G)**	GP-ROD	C+	Y	BUG+B	Air	35-37
120	**Corynebacterium striatum (CDC.I-1)**	GP-ROD	C+	Y	BUG+B	Air	35-37
121	**Corynebacterium thomssenii**	GP-ROD	C+	Y	BUG+B	Air	35-37
122	**Corynebacterium ulcerans**	GP-ROD	C+	Y	BUG+B	6.5%CO2	35-37
123	**Corynebacterium urealyticum**	GP-ROD	C+	Y	BUG+B	Air	35-37
124	**Corynebacterium variabile (Caseobacter polymorphus)**	GP-ROD	C+	Y	BUG+B	Air	35-37
125	**Corynebacterium vitaeruminis**	GP-ROD	C+	Y	BUG+B	Air	35-37
126	**"Corynebacterium" xerosis (GPC)**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
127	**Curtobacterium albidum**	GP-ROD	C+	N	BUG	Air	30
128	**Curtobacterium citreum**	GP-ROD	C+	N	BUG	Air	30
129	**Curtobacterium flaccumfaciens**	GP-ROD	C+	N	BUG	Air	30
130	**Curtobacterium luteum**	GP-ROD	C+	N	BUG	Air	30
131	**Curtobacterium pusillum**	GP-ROD	C+	N	BUG	Air	30
132	**Deinococcus grandis**	GP-COCCUS	C+	Y	BUG+B	Air	30

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
133	**Deinococcus proteolyticus**	GP-COCCUS	C+	Y	BUG+B	Air	30
134	**Deinococcus radiodurans**	GP-COCCUS	C+	Y	BUG+B	Air	30
135	**Deinococcus radiophilus**	GP-COCCUS	C+	Y	BUG+B	Air	30
136	**Deinococcus radiopugnans**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
137	**Dermabacter hominis**	GP-ROD	C+	Y	BUG+B	Air	35-37
138	**Dermacoccus nishinomiyaensis**	GP-COCCUS	C+	Y	BUG+B	Air	30
139	**Dolosicoccus paucivorans**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
140	**Dolosigranulum pigrum**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
141	**Enterococcus avium**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
142	**Enterococcus casseliflavus**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
143	**Enterococcus cecorum**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
144	**Enterococcus columbae**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
145	**Enterococcus dispar**	GP-COCCUS	C-	Y	BUG+B	Air	30
146	**Enterococcus durans**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
147	**Enterococcus faecalis**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
148	**Enterococcus faecium**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
149	**Enterococcus flavescens**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
150	**Enterococcus gallinarum**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
151	**Enterococcus hirae**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
152	**Enterococcus malodoratus**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
153	**Enterococcus mundtii**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
154	**Enterococcus pseudoavium**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
155	**Enterococcus raffinosus**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
156	**Enterococcus saccharolyticus**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
157	**Enterococcus solitarius**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
158	**Enterococcus sulfureus**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
159	**Eremococcus coleocola**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
160	**Erysipelothrix rhusiopathiae/tonsillarum**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
161	**Exiguobacterium acetylicum**	GP-ROD	C+	Y	BUG+B	Air	30
162	**Gardnerella vaginalis**	GP-ROD	C-	Y	BUG+B	6.5%CO2	35-37
163	**Gemella bergeri**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
164	**Gemella haemolysans/morbillorum**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
165	**Gemella palaticanis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
166	**Gemella sanguinis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
167	**Geobacillus stearothermophilus**	GP-ROD SB	C-/W+	N	BUG+M	Air	55
168	**Geobacillus thermoglucosidasius**	GP-ROD SB	C-/W+	N	BUG+M	Air	55
169	**Globicatella sanguinis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
170	**Gordonia aichiensis**	GP-ROD	C+	Y	BUG+B	Air	35-37
171	**Gordonia bronchialis**	GP-ROD	C+	Y	BUG+B	Air	35-37
172	**Gordonia rubroprincta**	GP-ROD	C+	Y	BUG+B	Air	35-37
173	**Gordonia sputi**	GP-ROD	C+	Y	BUG+B	Air	35-37
174	**Gordonia terrae**	GP-ROD	C+	Y	BUG+B	Air	35-37
175	**Helcococcus kunzii**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
176	**Ignavigranum rouffiae**	GP-COCCUS	C+/-	Y	BUG+B	6.5%CO2	35-37
177	**Jonesia denitrificans**	GP-ROD	C+	Y	BUG+B	Air	35-37
178	**Kocuria kristinae**	GP-COCCUS	C+	Y	BUG+B	Air	30
179	**Kocuria rosea**	GP-COCCUS	C+	Y	BUG+B	Air	30
180	**Kocuria varians**	GP-COCCUS	C+	Y	BUG+B	Air	30
181	**Kurthia gibsonii**	GP-ROD	C+	Y	BUG+B	Air	30
182	**Kurthia sibirica**	GP-ROD	C+	Y	BUG+B	Air	30
183	**Kurthia zopfii**	GP-ROD	C+	Y	BUG+B	Air	35-37
184	**Kytococcus sedentarius**	GP-COCCUS	C+	Y	BUG+B	Air	30
185	**Lactococcus garvieae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
186	**Lactococcus lactis ss cremoris**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
187	**Lactococcus lactis ss diacetylactis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
188	**Lactococcus lactis ss hordniae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
189	**Lactococcus lactis ss lactis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
190	**Lactococcus plantarum**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
191	**Lactococcus raffinolactis**	GP-COCCUS	C-	Y	BUG+B	Air	30
192	**Leifsonia aquatica**	GP-ROD	C+	Y	BUG+B	Air	35-37
193	**Leuconostoc carnosum**	GP-COCCUS	C-	Y	BUG+B	Air	30
194	**Leuconostoc citreum**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
195	**Leuconostoc fallax**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
196	**Leuconostoc gelidum**	GP-COCCUS	C-	Y	BUG+B	Air	30
197	**Leuconostoc lactis**	GP-COCCUS	C-	Y	BUG+B	Air	30
198	**Leuconostoc mesenteroides**	GP-COCCUS	C-	Y	BUG+B	Air	30
199	**Leuconostoc mesenteroides ss dextranicum**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
200	**Leuconostoc mesenteroides ss mesenteroides**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
201	**Listeria grayi**	GP-ROD	C+	Y	BUG+B	Air	35-37
202	**Listeria innocua/monocytogenes/seeligeri/welshimeri**	GP-ROD	C+	Y	BUG+B	Air	35-37
203	**Listeria ivanovii**	GP-ROD	C+	Y	BUG+B	Air	35-37
204	**Listeria ivanovii ss londoniensis**	GP-ROD	C+	Y	BUG+B	Air	35-37
205	**Listeria monocytogenes/innocua/seeligeri/welshimeri**	GP-ROD	C+	Y	BUG+B	Air	35-37
206	**Listeria seeligeri/innocua/monocytogenes/welshimeri**	GP-ROD	C+	Y	BUG+B	Air	35-37
207	**Listeria welshimeri/innocua/monocytogenes/seeligeri**	GP-ROD	C+	Y	BUG+B	Air	35-37
208	**Macrococcus bovicus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
209	**Macrococcus carouselicus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
210	**Macrococcus caseolyticus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
211	**Macrococcus equipercicus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
212	**Microbacterium arborescens**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
213	**Microbacterium esteraromaticum**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
214	**Microbacterium flavescens**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
215	**Microbacterium imperiale**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
216	**Microbacterium lacticum**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
217	**Microbacterium laevaniformans**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
218	**Microbacterium liquefaciens**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
219	**Microbacterium maritypicum**	GP-ROD	C+/-	Y	BUG+B	Air	30
220	**Microbacterium saperdae**	GP-ROD	C+/-	Y	BUG+B	Air	30
221	**Microbacterium spp. (CDC.A-4)**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
222	**Microbacterium spp. (CDC.A-5)**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
223	**Microbacterium terregens**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
224	**Microbacterium testaceum**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
225	**"Micrococcus diversus"**	GP-COCCUS	C+	Y	BUG+B	Air	30
226	**Micrococcus luteus**	GP-COCCUS	C+	Y	BUG+B	Air	30
227	**Micrococcus luteus (ATCC 9341)**	GP-COCCUS	C+	Y	BUG+B	Air	30
228	**Micrococcus lylae**	GP-COCCUS	C+	Y	BUG+B	Air	30
229	**Paenibacillus azotofixans**	GP-ROD SB	C-	N	BUG+M	Air	30
230	**Paenibacillus larvae ss larvae**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
231	**Paenibacillus macerans**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
232	**Paenibacillus pabuli**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
233	**Paenibacillus polymyxa**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
234	**Paenibacillus popilliae**	GP-ROD SB	C-	N	BUG+M	Air	30
235	**Paenibacillus validus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30
236	**Pediococcus acidilactici/parvulus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
237	**Pediococcus dextrinicus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
238	**Pediococcus pentosaceus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
239	**Pediococcus urinaeequi**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
240	**Pediococcus urinaeequi-like**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
241	**Rathayibacter rathayi**	GP-ROD	C+	N	BUG	Air	30
242	**Rathayibacter tritici**	GP-ROD	C+	N	BUG	Air	30
243	**Rhodococcus australis**	GP-ROD	C+	Y	BUG+B	Air	35-37
244	**Rhodococcus coprophilus**	GP-ROD	C+	Y	BUG+B	Air	35-37
245	**Rhodococcus equi**	GP-ROD	C+	Y	BUG+B	Air	35-37
246	**Rhodococcus erythropolis**	GP-ROD	C+	Y	BUG+B	Air	35-37
247	**Rhodococcus fascians**	GP-ROD	C+	Y	BUG+B	Air	35-37
248	**Rhodococcus globerulus**	GP-ROD	C+	Y	BUG+B	Air	35-37
249	**Rhodococcus rhodnii**	GP-ROD	C+	Y	BUG+B	Air	35-37
250	**Rhodococcus rhodochrous**	GP-ROD	C+	Y	BUG+B	Air	35-37
251	**Rhodococcus ruber**	GP-ROD	C+	Y	BUG+B	Air	35-37
252	**Rothia dentocariosa**	GP-ROD	C+/-	Y	BUG+B	Air	35-37
253	**Rothia mucilaginosa**	GP-COCCUS	C-/W+	Y	BUG+B	Air	35-37
254	**Sanguibacter inulinus**	GP-ROD	C+	Y	BUG+B	6.5%CO2	35-37
255	**Sanguibacter keddieii**	GP-ROD	C+	Y	BUG+B	Air	30
256	**Sanguibacter suarezii**	GP-ROD	C+	Y	BUG+B	Air	30
257	**Staphylococcus arlettae**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
258	**Staphylococcus aureus ss anaerobius**	GP-COCCUS	C-	Y	BUG+B	Air	35-37
259	**Staphylococcus aureus ss aureus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
260	**Staphylococcus auricularis**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
261	**Staphylococcus capitis**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
262	**Staphylococcus caprae**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
263	**Staphylococcus carnosus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
264	**Staphylococcus chromogenes**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
265	**Staphylococcus cohnii**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
266	**Staphylococcus delphini**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
267	**Staphylococcus epidermidis**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
268	**Staphylococcus equorum**	GP-COCCUS	C+	Y	BUG+B	Air	35-37

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	Species Name	Type	Test	Thio	Medium	Atm	Temp
269	**Staphylococcus felis**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
270	**Staphylococcus gallinarum**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
271	**Staphylococcus haemolyticus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
272	**Staphylococcus hominis**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
273	**Staphylococcus hominis ss novobiosepticus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
274	**Staphylococcus hyicus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
275	**Staphylococcus intermedius**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
276	**Staphylococcus kloosii**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
277	**Staphylococcus lentus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
278	**Staphylococcus lugdunensis**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
279	**Staphylococcus lutrae**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
280	**Staphylococcus muscae**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
281	**Staphyloccocus pasteuri**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
282	**Staphylococcus piscifermentans**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
283	**Staphylococcus pulvereri/vitulinus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
284	**Staphylococcus saprophyticus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
285	**Staphylococcus schleiferi**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
286	**Staphylococcus sciuri**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
287	**Staphylococcus sciuri ss rodentium**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
288	**Staphylococcus simulans**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
289	**Staphylococcus warneri**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
290	**Staphylococcus xylosus**	GP-COCCUS	C+	Y	BUG+B	Air	35-37
291	**Streptococcus acidominimus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
292	**Streptococcus agalactiae A (GP B)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
293	**Streptococcus agalactiae B (GP B)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
294	**Streptococcus alactolyticus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
295	**Streptococcus anginosus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
296	**Streptococcus bovis (GP D)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
297	**Streptococcus canis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
298	**Streptococcus constellatus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
299	**Streptococcus criceti**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
300	**Streptococcus cristatus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
301	**Streptococcus downei**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
302	**Streptococcus dysgalactiae ss dysgalactiae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
303	**Streptococcus dysgalactiae ss equisimilis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
304	**Streptococcus equi ss equi**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
305	**Streptococcus equi ss zooepidemicus (GP C)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
306	**Streptococcus equinus (GP D)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
307	**Streptococcus ferus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
308	**Streptococcus gallolyticus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
309	**Streptococcus gordonii**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
310	**Streptococcus hyointestinalis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
311	**Streptococcus hyovaginalis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
312	**Streptococcus infantarius ss coli**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
313	**Streptococcus infantarius ss infantarius**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
314	**Streptococcus infantis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
315	**Streptococcus iniae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
316	**Streptococcus intermedius**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
317	**Streptococcus intestinalis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
318	**Streptococcus macacae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
319	**Streptococcus macedonicus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
320	**Streptococcus mitis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
321	**Streptococcus mutans/ratti**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
322	**Streptococcus oralis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
323	**Streptococcus parasanguinis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
324	**Streptococcus peroris**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
325	**Streptococcus phocae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
326	**Streptococcus pluranimalium**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
327	**Streptococcus pneumoniae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
328	**Streptococcus porcinus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
329	**Streptococcus pyogenes A (GP A)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
330	**Streptococcus pyogenes B (GP A)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
331	**Streptococcus pyogenes C (GP A)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
332	**Streptococcus salivarius**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
333	**Streptococcus sanguinis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
334	**Streptococcus sobrinus**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
335	**Streptococcus suis (GP RST)**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
336	**Streptococcus suis serogroup 1/2**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37

†*Agricultural bacteria that may be grown on BUG without blood.*
*** Found in the Dangerous Pathogen database*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
337	**Streptococcus suis serogroup 4/6**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
338	**Streptococcus suis serogroup 5**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
339	**Streptococcus suis serogroup 7**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
340	**Streptococcus thoraltensis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
341	**Streptococcus uberis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
342	**Streptococcus vestibularis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
343	**Streptococcus waius**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
344	**Tetragenococcus halophilus**	GP-COCCUS	C-	Y	BUG+B	Air	30
345	**Tsukamurella inchonensis**	GP-ROD	C+	Y	BUG+B	Air	35-37
346	**Tsukamurella paurometabola**	GP-ROD	C+	Y	BUG+B	Air	35-37
347	**Turicella otitidis**	GP-ROD	C+	Y	BUG+B	Air	35-37
348	**Vagococcus fluvialis**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
349	**Vagococcus lutrae**	GP-COCCUS	C-	Y	BUG+B	6.5%CO2	35-37
350	**Vagococcus salmoninarum**	GP-COCCUS	C-	Y	BUG+B	Air	26
351	**Virgibacillus pantothenticus**	GP-ROD SB	C-/W+	N	BUG+M	Air	30

†*Agricultural bacteria that may be grown on BUG without blood.*
*** Found in the Dangerous Pathogen database*

Anaerobic Bacteria

	Species Name	Type	Test	Thio	Medium	Atm	Temp
1	**Abiotrophia defectiva**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
2	**Acetivibrio ethanolgignens**	AN GN-ROD	N/A	N	BUA	ANA	35-37
3	**Acetoanaerobium noterae**	AN GN-ROD	N/A	N	BUA	ANA	35-37
4	**Acidaminococcus fermentans**	AN GN-COCCUS	N/A	N	BUA	ANA	35-37
5	**Actinobaculum schaalii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
6	**Actinobaculum suis***	AN GP-ROD	N/A	N	BUA	ANA	35-37
7	**Actinomyces bovis BGA***	AN GP-ROD	N/A	N	BUA	ANA	35-37
8	**Actinomyces bovis BGB***	AN GP-ROD	N/A	N	BUA	ANA	35-37
9	**Actinomyces europaeus***	AN GP-ROD	N/A	N	BUA	ANA	35-37
10	**Actinomyces graevenitzii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
11	**Actinomyces howellii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
12	**Actinomyces hyovaginalis***	AN GP-ROD	N/A	N	BUA	ANA	35-37
13	**Actinomyces israelii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
14	**Actinomyces meyeri***	AN GP-ROD	N/A	N	BUA	ANA	35-37
15	**Actinomyces naeslundii/viscosus***	AN GP-ROD	N/A	N	BUA	ANA	35-37
16	**Actinomyces neuii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
17	**Actinomyces odontolyticus***	AN GP-ROD	N/A	N	BUA	ANA	35-37
18	**Actinomyces radingae***	AN GP-ROD	N/A	N	BUA	ANA	35-37
19	**Actinomyces slackii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
20	**Actinomyces turicensis***	AN GP-ROD	N/A	N	BUA	ANA	35-3
21	**Anaerobiospirillum succiniproducens**	AN GN-ROD	N/A	N	BUA	ANA	35-37
22	**Anaeromusa acidaminophila**	AN GN-ROD	N/A	N	BUA	ANA	35-37
23	**Anaerorhabdus furcosa**	AN GN-ROD	N/A	N	BUA	ANA	35-37
24	**Anaerosinus glycerini**	AN GN-ROD	N/A	N	BUA	ANA	35-37
25	**Arcanobacterium pyogenes***	AN GP-ROD	N/A	N	BUA	ANA	35-37
26	**Atopobium fossor**	AN GP-ROD	N/A	N	BUA	ANA	35-37
27	**Atopobium minutum**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
28	**Atopobium parvulum**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
29	**Bacteroides caccae***	AN GN-ROD	N/A	N	BUA	ANA	35-37
30	**Bacteroides coagulans***	AN GN-ROD	N/A	N	BUA	ANA	35-37
31	**Bacteroides distasonis***	AN GN-ROD	N/A	N	BUA	ANA	35-37
32	**Bacteroides eggerthii***	AN GN-ROD	N/A	N	BUA	ANA	35-37
33	**Bacteroides forsythus***	AN GN-ROD	N/A	N	BUA	ANA	35-37
34	**Bacteroides fragilis BGA***	AN GN-ROD	N/A	N	BUA	ANA	35-37
35	**Bacteroides fragilis BGB***	AN GN-ROD	N/A	N	BUA	ANA	35-37
36	**Bacteroides helcogenes***	AN GN-ROD	N/A	N	BUA	ANA	35-37
37	**Bacteroides merdae***	AN GN-ROD	N/A	N	BUA	ANA	35-37
38	**Bacteroides ovatus***	AN GN-ROD	N/A	N	BUA	ANA	35-37
39	**Bacteroides pectinophilus***	AN GN-ROD	N/A	N	BUA	ANA	35-37
40	**Bacteroides putredinis***	AN GN-ROD	N/A	N	BUA	ANA	35-37
41	**Bacteroides pyogenes***	AN GN-ROD	N/A	N	BUA	ANA	35-37
42	**Bacteroides splanchnicus***	AN GN-ROD	N/A	N	BUA	ANA	35-37
43	**Bacteroides stercoris***	AN GN-ROD	N/A	N	BUA	ANA	35-37
44	**Bacteroides suis***	AN GN-ROD	N/A	N	BUA	ANA	35-37
45	**Bacteroides tectus***	AN GN-ROD	N/A	N	BUA	ANA	35-37
46	**Bacteroides thetaiotaomicron***	AN GN-ROD	N/A	N	BUA	ANA	35-37
47	**Bacteroides uniformis***	AN GN-ROD	N/A	N	BUA	ANA	35-37
48	**Bacteroides ureolyticus***	AN GN-ROD	N/A	N	BUA	ANA	35-37
49	**Bacteroides vulgatus***	AN GN-ROD	N/A	N	BUA	ANA	35-37
50	**Bifidobacterium adolescentis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
51	**Bifidobacterium angulatum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
52	**Bifidobacterium animalis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
53	**Bifidobacterium asteroides**	AN GP-ROD	N/A	N	BUA	ANA	35-37
54	**Bifidobacterium bifidum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
55	**Bifidobacterium boum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
56	**Bifidobacterium breve**	AN GP-ROD	N/A	N	BUA	ANA	35-37
57	**Bifidobacterium catenulatum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
58	**Bifidobacterium choerinum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
59	**Bifidobacterium coryneforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
60	**Bifidobacterium cuniculi**	AN GP-ROD	N/A	N	BUA	ANA	35-37
61	**Bifidobacterium dentium**	AN GP-ROD	N/A	N	BUA	ANA	35-37
62	**Bifidobacterium gallicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
63	**Bifidobacterium gallinarum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
64	**Bifidobacterium indicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
65	**Bifidobacterium infantis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
66	**Bifidobacterium longum**	AN GP-ROD	N/A	N	BUA	ANA	35-37

**Indicates species that require a MicroStation Reader for identification.*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
67	**Bifidobacterium magnum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
68	**Bifidobacterium merycicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
69	**Bifidobacterium minimum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
70	**Bifidobacterium pseudocatenulatum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
71	**Bifidobacterium pseudolongum ss globosum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
72	**Bifidobacterium pseudolongum ss pseudolongum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
73	**Bifidobacterium pullorum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
74	**Bifidobacterium ruminantium**	AN GP-ROD	N/A	N	BUA	ANA	35-37
75	**Bifidobacterium saeculare**	AN GP-ROD	N/A	N	BUA	ANA	35-37
76	**Bifidobacterium subtile**	AN GP-ROD	N/A	N	BUA	ANA	35-37
77	**Bifidobacterium suis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
78	**Bifidobacterium thermophilum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
79	**Bilophila wadsworthia**	AN GN-ROD	N/A	N	BUA	ANA	35-37
80	**Butyrivibrio fibrisolvens***	AN GP-ROD	N/A	N	BUA	ANA	35-37
81	**Campylobacter curvus/gracilis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
82	**Campylobacter rectus**	AN GN-ROD	N/A	N	BUA	ANA	35-37
83	**Catonella morbi**	AN GN-ROD	N/A	N	BUA	ANA	35-37
84	**Centipeda periodontii**	AN GN-ROD	N/A	N	BUA	ANA	35-37
85	**Clostridium absonum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
86	**Clostridium acetobutylicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
87	**Clostridium aerotolerans**	AN GP-ROD	N/A	N	BUA	ANA	35-37
88	**Clostridium "aminobutyricum"**	AN GP-ROD	N/A	N	BUA	ANA	35-37
89	**Clostridium aminophilum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
90	**Clostridium aminovalericum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
91	**Clostridium barati**	AN GP-ROD	N/A	N	BUA	ANA	35-37
92	**Clostridium botulinum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
93	**Clostridium cadaveris**	AN GP-ROD	N/A	N	BUA	ANA	35-37
94	**Clostridium carnis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
95	**Clostridium cellobioparum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
96	**Clostridium cellulolyticum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
97	**Clostridium clostridiiforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
98	**Clostridium coccoides**	AN GP-ROD	N/A	N	BUA	ANA	35-37
99	**Clostridium cochlearium**	AN GP-ROD	N/A	N	BUA	ANA	35-37
100	**Clostridium cocleatum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
101	**Clostridium colinum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
102	**Clostridium cylindrosporum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
103	**Clostridium difficile**	AN GP-ROD	N/A	N	BUA	ANA	35-37
104	**Clostridium fallax**	AN GP-ROD	N/A	N	BUA	ANA	35-37
105	**Clostridium glycolicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
106	**Clostridium hastiforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
107	**Clostridium hydroxybenzoicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
108	**Clostridium innocuum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
109	**Clostridium intestinale**	AN GP-ROD	N/A	N	BUA	ANA	35-37
110	**Clostridium irregularis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
111	**Clostridium magnum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
112	**Clostridium malenominatum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
113	**Clostridium nexile**	AN GP-ROD	N/A	N	BUA	ANA	35-37
114	**Clostridium novyi**	AN GP-ROD	N/A	N	BUA	ANA	35-37
115	**Clostridium orbiscindens**	AN GP-ROD	N/A	N	BUA	ANA	35-37
116	**Clostridium oroticum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
117	**Clostridium papyrosolvens**	AN GP-ROD	N/A	N	BUA	ANA	35-37
118	**Clostridium paraputrificum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
119	**Clostridium pasteurianum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
120	**Clostridium perfringens**	AN GP-ROD	N/A	N	BUA	ANA	35-37
121	**Clostridium propionicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
122	**Clostridium purinolyticum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
123	**Clostridium putrificum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
124	**Clostridium ramosum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
125	**Clostridium rectum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
126	**Clostridium saccharolyticum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
127	**Clostridium sardiniensis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
128	**Clostridium sartagoformum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
129	**Clostridium scatologenes**	AN GP-ROD	N/A	N	BUA	ANA	35-37
130	**Clostridium scindens**	AN GP-ROD	N/A	N	BUA	ANA	35-37
131	**Clostridium septicum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
132	**Clostridium sordelli**	AN GP-ROD	N/A	N	BUA	ANA	35-37
133	**Clostridium sphenoides**	AN GP-ROD	N/A	N	BUA	ANA	35-37
134	**Clostridium spiroforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
135	**Clostridium sporogenes**	AN GP-ROD	N/A	N	BUA	ANA	35-37

**Indicates species that require a MicroStation Reader for identification.*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
136	**Clostridium sporosphaeroides**	AN GP-ROD	N/A	N	BUA	ANA	35-37
137	**Clostridium sticklandii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
138	**Clostridium subterminale**	AN GP-ROD	N/A	N	BUA	ANA	35-37
139	**Clostridium symbiosum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
140	**Clostridium tertium**	AN GP-ROD	N/A	N	BUA	ANA	35-37
141	**Clostridium tetani**	AN GP-ROD	N/A	N	BUA	ANA	35-37
142	**Clostridium tetanomorphum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
143	**Clostridium tyrobutyricum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
144	**Clostridium/Eubacterium species**	AN GP-ROD	N/A	N	BUA	ANA	35-37
145	**Collinsella aerofaciens**	AN GP-ROD	N/A	N	BUA	ANA	35-37
146	**Coprococcus catus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
147	**Dendrosporobacter quercicolus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
148	**Desulfobulbus elongatus**	AN GN-ROD	N/A	N	BUA	ANA	35-37
149	**Desulfomonas pigra**	AN GN-ROD	N/A	N	BUA	ANA	35-37
150	**Desulfomonile tiedjei**	AN GN-ROD	N/A	N	BUA	ANA	35-37
151	**Desulfovibrio desulfuricans ss desulfuricans**	AN GN-ROD	N/A	N	BUA	ANA	35-37
152	**Desulfovibrio fructosivorans**	AN GN-ROD	N/A	N	BUA	ANA	35-37
153	**Desulfovibrio vulgaris ss vulgaris**	AN GN-ROD	N/A	N	BUA	ANA	35-37
154	**Eggerthella lenta***	AN GP-ROD	N/A	N	BUA	ANA	35-37
155	**Eikenella corrodens***	AN GN-ROD	N/A	N	BUA	ANA	35-37
156	**Eubacterium angustum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
157	**Eubacterium barkeri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
158	**Eubacterium biforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
159	**Eubacterium brachy**	AN GP-ROD	N/A	N	BUA	ANA	35-37
160	**Eubacterium budayi**	AN GP-ROD	N/A	N	BUA	ANA	35-37
161	**Eubacterium combesii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
162	**Eubacterium contortum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
163	**Eubacterium cylindroides**	AN GP-ROD	N/A	N	BUA	ANA	35-37
164	**Eubacterium desmolans**	AN GP-ROD	N/A	N	BUA	ANA	35-37
165	**Eubacterium dolichum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
166	**Eubacterium fissicatena**	AN GP-ROD	N/A	N	BUA	ANA	35-37
167	**Eubacterium hallii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
168	**Eubacterium limosum BGA**	AN GP-ROD	N/A	N	BUA	ANA	35-37
169	**Eubacterium limosum BGB**	AN GP-ROD	N/A	N	BUA	ANA	35-37
170	**Eubacterium moniliforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
171	**Eubacterium multiforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
172	**Eubacterium nodatum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
173	**Eubacterium plautii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
174	**Eubacterium saburreum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
175	**Eubacterium tortuosum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
176	**Eubacterium uniforme**	AN GP-ROD	N/A	N	BUA	ANA	35-37
177	**Eubacterium yurii ss margaretiae**	AN GP-ROD	N/A	N	BUA	ANA	35-37
178	**Eubacterium yurii ss schtitka**	AN GP-ROD	N/A	N	BUA	ANA	35-37
179	**Eubacterium yurii ss yurii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
180	**Facklamia hominis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
181	**Facklamia sourekii**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
182	**Falcivibrio grandis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
183	**Falcivibrio vaginalis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
184	**Filifactor alocis***	AN GN-ROD	N/A	N	BUA	ANA	35-37
185	**Filifactor villosus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
186	**Finegoldia magna**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
187	**Fusobacterium gonidiaformans***	AN GN-ROD	N/A	N	BUA	ANA	35-37
188	**Fusobacterium naviforme***	AN GN-ROD	N/A	N	BUA	ANA	35-37
189	**Fusobacterium necrogenes***	AN GN-ROD	N/A	N	BUA	ANA	35-37
190	**Fusobacterium necrophorum***	AN GN-ROD	N/A	N	BUA	ANA	35-37
191	**Fusobacterium nucleatum ss animalis***	AN GN-ROD	N/A	N	BUA	ANA	35-37
192	**Fusobacterium nucleatum ss fusiforme***	AN GN-ROD	N/A	N	BUA	ANA	35-37
193	**Fusobacterium nucleatum ss nucleatum***	AN GN-ROD	N/A	N	BUA	ANA	35-37
194	**Fusobacterium nucleatum ss polymorphum***	AN GN-ROD	N/A	N	BUA	ANA	35-37
195	**Fusobacterium nucleatum ss vincentii***	AN GN-ROD	N/A	N	BUA	ANA	35-37
196	**Fusobacterium russii***	AN GN-ROD	N/A	N	BUA	ANA	35-37
197	**Fusobacterium simiae***	AN GN-ROD	N/A	N	BUA	ANA	35-37
198	**Fusobacterium ulcerans***	AN GN-ROD	N/A	N	BUA	ANA	35-37
199	**Fusobacterium varium***	AN GN-ROD	N/A	N	BUA	ANA	35-37
200	**Gardnerella vaginalis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
201	**Gemella bergeri**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
202	**Gemella haemolysans**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
203	**Gemella morbillorum**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
204	**Granulicatella adiacens**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37

**Indicates species that require a MicroStation Reader for identification.*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
205	**Hallella seregens**	AN GN-ROD	N/A	N	BUA	ANA	35-37
206	**Lactobacillus acetotolerans**	AN GP-ROD	N/A	N	BUA	ANA	35-37
207	**Lactobacillus acidophilus BGA**	AN GP-ROD	N/A	N	BUA	ANA	35-37
208	**Lactobacillus acidophilus BGB**	AN GP-ROD	N/A	N	BUA	ANA	35-37
209	**Lactobacillus alimentarius**	AN GP-ROD	N/A	N	BUA	ANA	35-37
210	**Lactobacillus amylovorus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
211	**Lactobacillus aviarius ss araffinosus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
212	**Lactobacillus aviarius ss aviarius**	AN GP-ROD	N/A	N	BUA	ANA	35-37
213	**Lactobacillus bifermentans**	AN GP-ROD	N/A	N	BUA	ANA	35-37
214	**Lactobacillus brevis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
215	**Lactobacillus buchneri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
216	**Lactobacillus casei**	AN GP-ROD	N/A	N	BUA	ANA	35-37
217	**Lactobacillus catenaformis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
218	**Lactobacillus collinoides**	AN GP-ROD	N/A	N	BUA	ANA	26
219	**Lactobacillus coryniformis ss coryniformis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
220	**Lactobacillus coryniformis ss torquens**	AN GP-ROD	N/A	N	BUA	ANA	35-37
221	**Lactobacillus crispatus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
222	**Lactobacillus curvatus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
223	**Lactobacillus delbrueckii ss bulgaricus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
224	**Lactobacillus delbrueckii ss delbrueckii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
225	**Lactobacillus delbrueckii ss lactis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
226	**Lactobacillus farciminis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
227	**Lactobacillus fermentum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
228	**Lactobacillus fructivorans**	AN GP-ROD	N/A	N	BUA	ANA	35-37
229	**Lactobacillus fructosus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
230	**Lactobacillus gasseri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
231	**Lactobacillus hamsteri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
232	**Lactobacillus helveticus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
233	**Lactobacillus hilgardii**	AN GP-ROD	N/A	N	BUA	ANA	26
234	**Lactobacillus jensenii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
235	**Lactobacillus kefiri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
236	**Lactobacillus malefermentans**	AN GP-ROD	N/A	N	BUA	ANA	30
237	**Lactobacillus mali/sakei ss sakei**	AN GP-ROD	N/A	N	BUA	ANA	35-37
238	**Lactobacillus murinus/paracasei ss tolerans**	AN GP-ROD	N/A	N	BUA	ANA	35-37
239	**Lactobacillus oris/parabuchneri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
240	**Lactobacillus paracasei ss paracasei**	AN GP-ROD	N/A	N	BUA	ANA	35-37
241	**Lactobacillus pentosus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
242	**Lactobacillus plantarum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
243	**Lactobacillus reuteri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
244	**Lactobacillus rhamnosus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
245	**Lactobacillus salivarius ss salicinius**	AN GP-ROD	N/A	N	BUA	ANA	35-37
246	**Lactobacillus salivarius ss salivarius**	AN GP-ROD	N/A	N	BUA	ANA	35-37
247	**Lactobacillus sanfranciscensis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
248	**Lactobacillus suebicus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
249	**Lactobacillus vaginalis**	AN GP-ROD	N/A	N	BUA	ANA	35-37
250	**Lactococcus garvieae**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
251	**Lactococcus lactis ss cremoris**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
252	**Lactococcus lactis ss hordniae**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
253	**Lactococcus lactis ss lactis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
254	**Lactococcus plantarum**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
255	**Lactococcus raffinolactis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
256	**Leuconostoc carnosum**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
257	**Leuconostoc citreum**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
258	**Leuconostoc fallax**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
259	**Leuconostoc gelidum**	AN GP-COCCUS	N/A	N	BUA	ANA	26
260	**Leuconostoc lactis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
261	**Leuconostoc mesenteroides ss cremoris**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
262	**Leuconostoc mesenteroides ss dextranicum**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
263	**Leuconostoc mesenteroides ss mesenteroides**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
264	**Megamonas hypermegale**	AN GN-ROD	N/A	N	BUA	ANA	35-37
265	**Megasphaera cerevisiae**	AN GN-COCCUS	N/A	N	BUA	ANA	35-37
266	**Megasphaera elsdenii**	AN GN-COCCUS	N/A	N	BUA	ANA	35-37
267	**Micromonas micros**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
268	**Mobiluncus curtisii**	AN GP-ROD	N/A	N	BUA	ANA	35-37
269	**Mobiluncus mulieris**	AN GP-ROD	N/A	N	BUA	ANA	35-37
270	**Mongibacterium timidum**	AN GP-ROD	N/A	N	BUA	ANA	35-37
271	**Pectinatus cerevisiiphilus**	AN GN-ROD	N/A	N	BUA	ANA	30
272	**Pectinatus frisingensis**	AN GN-ROD	N/A	N	BUA	ANA	30
273	**Pediococcus acidilactici**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37

**Indicates species that require a MicroStation Reader for identification.*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
274	**Pediococcus dextrinicus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
275	**Pediococcus parvulus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
276	**Pediococcus pentosaceus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
277	**Pediococcus urinaeequi**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
278	**Peptostreptococcus anaerobius**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
279	**Peptostreptococcus asaccharolyticus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
280	**Peptostreptococcus barnesae**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
281	**Peptostreptococcus hydrogenalis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
282	**Peptostreptococcus indolicus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
283	**Peptostreptococcus lacrimalis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
284	**Peptostreptococcus lactolyticus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
285	**Peptostreptococcus prevotii**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
286	**Peptostreptococcus tetradius**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
287	**Peptostreptococcus vaginalis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
288	**Porphyromonas asaccharolytica**	AN GN-ROD	N/A	N	BUA	ANA	35-37
289	**Porphyromonas circumdentaria/endodontalis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
290	**Porphyromonas gingivalis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
291	**Porphyromonas levii**	AN GN-ROD	N/A	N	BUA	ANA	35-37
292	**Porphyromonas macacae**	AN GN-ROD	N/A	N	BUA	ANA	35-37
293	**Prevotella bivia**	AN GN-ROD	N/A	N	BUA	ANA	35-37
294	**Prevotella buccae**	AN GN-ROD	N/A	N	BUA	ANA	35-37
295	**Prevotella buccalis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
296	**Prevotella corporis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
297	**Prevotella denticola**	AN GN-ROD	N/A	N	BUA	ANA	35-37
298	**Prevotella disiens (GNR Kan-R setup)**	AN GN-ROD	N/A	N	BUA	ANA	35-37
299	**Prevotella disiens (Standard AN setup)**	AN GN-ROD	N/A	N	BUA	ANA	35-37
300	**Prevotella heparinolytica**	AN GN-ROD	N/A	N	BUA	ANA	35-37
301	**Prevotella intermedia**	AN GN-ROD	N/A	N	BUA	ANA	35-37
302	**Prevotella loescheii**	AN GN-ROD	N/A	N	BUA	ANA	35-37
303	**Prevotella nigrescens**	AN GN-ROD	N/A	N	BUA	ANA	35-37
304	**Prevotella oralis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
305	**Prevotella oris (GNR Kan-R setup)**	AN GN-ROD	N/A	N	BUA	ANA	35-37
306	**Prevotella oulora**	AN GN-ROD	N/A	N	BUA	ANA	35-37
307	**Prevotella species**	AN GN-ROD	N/A	N	BUA	ANA	35-37
308	**Propionibacterium acidipropionici***	AN GP-ROD	N/A	N	BUA	ANA	35-37
309	**Propionibacterium acnes***	AN GP-ROD	N/A	N	BUA	ANA	35-37
310	**Propionibacterium avidum***	AN GP-ROD	N/A	N	BUA	ANA	35-37
311	**Propionibacterium freudenreichii ss freudenreichii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
312	**Propionibacterium granulosum***	AN GP-ROD	N/A	N	BUA	ANA	35-37
313	**Propionibacterium jensenii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
314	**Propionibacterium lymphophilum***	AN GP-ROD	N/A	N	BUA	ANA	35-37
315	**Propionibacterium propionicus***	AN GP-ROD	N/A	N	BUA	ANA	35-37
316	**Propionibacterium thoenii***	AN GP-ROD	N/A	N	BUA	ANA	35-37
317	**Pseudoramibacter alactolyticus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
318	**Rikenella microfusus**	AN GN-ROD	N/A	N	BUA	ANA	35-37
319	**Ruminococcus gnavus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
320	**Ruminococcus hansenii**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
321	**Ruminococcus lactaris**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
322	**Ruminococcus productus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
323	**Ruminococcus torques**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
324	**Sarcina maxima**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
325	**Sarcina ventriculi**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
326	**Sebaldella termitidis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
327	**Selenomonas flueggei**	AN GN-ROD	N/A	N	BUA	ANA	35-37
328	**Selenomonas infelix**	AN GN-ROD	N/A	N	BUA	ANA	35-37
329	**Selenomonas noxia**	AN GN-ROD	N/A	N	BUA	ANA	35-37
330	**Selenomonas sputigena**	AN GN-ROD	N/A	N	BUA	ANA	35-37
331	**Slackia heliotrinireducens**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
332	**Sporolactobacillus inulinus**	AN GP-ROD	N/A	N	BUA	ANA	35-37
333	**Sporomusa acidovorans**	AN GN-ROD	N/A	N	BUA	ANA	35-37
334	**Sporomusa ovata**	AN GN-ROD	N/A	N	BUA	ANA	35-37
335	**Sporomusa sphaeroides**	AN GN-ROD	N/A	N	BUA	ANA	35-37
336	**Staphylococcus aureus ss anaerobius**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
337	**Staphylococcus saccharolyticus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
338	**Streptococcus alactolyticus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
339	**Streptococcus anginosus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
340	**Streptococcus bovis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
341	**Streptococcus macacae**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
342	**Streptococcus mutans**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37

**Indicates species that require a MicroStation Reader for identification.*

	Species Name	Type	Test	Thio	Medium	Atm	Temp
343	**Streptococcus pleomorphus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
344	**Streptococcus suis**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
345	**Streptococcus thermophilus**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
346	**Succinivibrio dextrinosolvens**	AN GN-ROD	N/A	N	BUA	ANA	35-37
347	**Sutterella wadsworthensis**	AN GN-ROD	N/A	N	BUA	ANA	35-37
348	**Tetragenococcus halophilus**	AN GP-COCCUS	N/A	N	BUA	ANA	30
349	**Tissierella praeacuta**	AN GN-ROD	N/A	N	BUA	ANA	35-37
350	**Veillonella atypica/caviae/dispar/parvula**	AN GN-COCCUS	N/A	N	BUA	ANA	35-37
351	**Veillonella criceti**	AN GN-COCCUS	N/A	N	BUA	ANA	35-37
352	**Veillonella ratti**	AN GN-COCCUS	N/A	N	BUA	ANA	35-37
353	**Weissella confusa**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
354	**Weissella halotolerans/hellenica**	AN GP-ROD	N/A	N	BUA	ANA	35-37
355	**Weissella kandleri**	AN GP-ROD	N/A	N	BUA	ANA	35-37
356	**Weissella minor**	AN GP-ROD	N/A	N	BUA	ANA	35-37
357	**Weissella paramesenteroides**	AN GP-COCCUS	N/A	N	BUA	ANA	35-37
358	**Weissella viridescens**	AN GP-ROD	N/A	N	BUA	ANA	35-37
359	**Wolinella succinogenes**	AN GN-ROD	N/A	N	BUA	ANA	35-37
360	**Zymomonas mobilis ss mobilis***	AN GN-ROD	N/A	N	BUA	ANA	30
361	**Zymophilus paucivorans/raffinosivorans**	AN GN-ROD	N/A	N	BUA	ANA	30

**Indicates species that require a MicroStation Reader for identification.*

Yeasts

	Species Name	Type	Test	Thio	Medium	Atm	Temp
1	**Arthroascus javanensis**	N/A	N/A	N	BUY	Air	26
2	**Bulleromyces albus**	N/A	N/A	N	BUY	Air	26
3	**Candida aaseri A**	N/A	N/A	N	BUY	Air	26
4	**Candida aaseri B**	N/A	N/A	N	BUY	Air	26
5	**Candida albicans**	N/A	N/A	N	BUY	Air	26
6	**Candida apicola**	N/A	N/A	N	BUY	Air	26
7	**Candida azyma**	N/A	N/A	N	BUY	Air	26
8	**Candida blankii**	N/A	N/A	N	BUY	Air	26
9	**Candida boidinii**	N/A	N/A	N	BUY	Air	26
10	**Candida bombi**	N/A	N/A	N	BUY	Air	26
11	**Candida cantarelli**	N/A	N/A	N	BUY	Air	26
12	**Candida cariosilignicola**	N/A	N/A	N	BUY	Air	26
13	**Candida castellii**	N/A	N/A	N	BUY	Air	26
14	**Candida catenulata**	N/A	N/A	N	BUY	Air	26
15	**Candida diddensiae**	N/A	N/A	N	BUY	Air	26
16	**Candida diversa**	N/A	N/A	N	BUY	Air	26
17	**Candida edax**	N/A	N/A	N	BUY	Air	26
18	**Candida entomophila**	N/A	N/A	N	BUY	Air	26
19	**Candida ergastensis**	N/A	N/A	N	BUY	Air	26
20	**Candida etchellsii**	N/A	N/A	N	BUY	Air	26
21	**Candida famata**	N/A	N/A	N	BUY	Air	26
22	**Candida fluviatilis**	N/A	N/A	N	BUY	Air	26
23	**Candida freyschussii**	N/A	N/A	N	BUY	Air	26
24	**Candida friedrichii**	N/A	N/A	N	BUY	Air	26
25	**Candida fructus**	N/A	N/A	N	BUY	Air	26
26	**Candida fusiformata**	N/A	N/A	N	BUY	Air	26
27	**Candida galacta**	N/A	N/A	N	BUY	Air	26
28	**Candida geochares**	N/A	N/A	N	BUY	Air	26
29	**Candida glabrata**	N/A	N/A	N	BUY	Air	26
30	**Candida glaebosa**	N/A	N/A	N	BUY	Air	26
31	**Candida gropengiesseri**	N/A	N/A	N	BUY	Air	26
32	**Candida haemulonii**	N/A	N/A	N	BUY	Air	26
33	**Candida humilis**	N/A	N/A	N	BUY	Air	26
34	**Candida incommunis**	N/A	N/A	N	BUY	Air	26
35	**Candida insectalens**	N/A	N/A	N	BUY	Air	26
36	**Candida insectamans**	N/A	N/A	N	BUY	Air	26
37	**Candida insectorum**	N/A	N/A	N	BUY	Air	26
38	**Candida intermedia**	N/A	N/A	N	BUY	Air	26
39	**Candida ishiwadae**	N/A	N/A	N	BUY	Air	26
40	**Candida magnoliae**	N/A	N/A	N	BUY	Air	26
41	**Candida maltosa**	N/A	N/A	N	BUY	Air	26
42	**Candida maris**	N/A	N/A	N	BUY	Air	26
43	**Candida maritima**	N/A	N/A	N	BUY	Air	26
44	**Candida melibiosica**	N/A	N/A	N	BUY	Air	26
45	**Candida mogii**	N/A	N/A	N	BUY	Air	26
46	**Candida montana**	N/A	N/A	N	BUY	Air	26
47	**Candida multisgemmis**	N/A	N/A	N	BUY	Air	26
48	**Candida musae**	N/A	N/A	N	BUY	Air	26
49	**Candida nemodendra**	N/A	N/A	N	BUY	Air	26
50	**Candida nitratophila**	N/A	N/A	N	BUY	Air	26
51	**Candida norvegica**	N/A	N/A	N	BUY	Air	26
52	**Candida oleophila**	N/A	N/A	N	BUY	Air	26
53	**Candida parapsilosis A**	N/A	N/A	N	BUY	Air	26
54	**Candida parapsilosis B**	N/A	N/A	N	BUY	Air	26
55	**Candida pararugosa**	N/A	N/A	N	BUY	Air	26
56	**Candida peltata**	N/A	N/A	N	BUY	Air	26
57	**Candida pinus**	N/A	N/A	N	BUY	Air	26
58	**Candida rugosa A**	N/A	N/A	N	BUY	Air	26
59	**Candida rugosa B**	N/A	N/A	N	BUY	Air	26
60	**Candida sake**	N/A	N/A	N	BUY	Air	26
61	**Candida salmanticensis**	N/A	N/A	N	BUY	Air	26
62	**Candida santamariae**	N/A	N/A	N	BUY	Air	26
63	**Candida savonica**	N/A	N/A	N	BUY	Air	26
64	**Candida shehatae**	N/A	N/A	N	BUY	Air	26
65	**Candida shehatae var shehatae**	N/A	N/A	N	BUY	Air	26

	Species Name	Type	Test	Thio	Medium	Atm	Temp
66	**Candida silvae**	N/A	N/A	N	BUY	Air	26
67	**Candida silvatica**	N/A	N/A	N	BUY	Air	26
68	**Candida solani**	N/A	N/A	N	BUY	Air	26
69	**Candida sonorensis**	N/A	N/A	N	BUY	Air	26
70	**Candida sorbophila**	N/A	N/A	N	BUY	Air	26
71	**Candida sorboxylosa**	N/A	N/A	N	BUY	Air	26
72	**Candida spandovensis**	N/A	N/A	N	BUY	Air	26
73	**Candida succiphila**	N/A	N/A	N	BUY	Air	26
74	**Candida tropicalis A**	N/A	N/A	N	BUY	Air	26
75	**Candida tropicalis B**	N/A	N/A	N	BUY	Air	26
76	**Candida vanderwaltii**	N/A	N/A	N	BUY	Air	26
77	**Candida vartiovaarai**	N/A	N/A	N	BUY	Air	26
78	**Candida versatilis**	N/A	N/A	N	BUY	Air	26
79	**Candida viswanathii**	N/A	N/A	N	BUY	Air	26
80	**Candida wickerhamii**	N/A	N/A	N	BUY	Air	26
81	**Candida zeylanoides**	N/A	N/A	N	BUY	Air	26
82	**Citeromyces matritensis**	N/A	N/A	N	BUY	Air	26
83	**Clavispora lusitaniae**	N/A	N/A	N	BUY	Air	26
84	**Cryptococcus albidus**	N/A	N/A	N	BUY	Air	26
85	**Cryptococcus albidus var aerius**	N/A	N/A	N	BUY	Air	26
86	**Cryptococcus albidus var albidus**	N/A	N/A	N	BUY	Air	26
87	**Cryptococcus albidus var diffluens**	N/A	N/A	N	BUY	Air	26
88	**Cryptococcus amylolentus**	N/A	N/A	N	BUY	Air	26
89	**Cryptococcus curvatus A**	N/A	N/A	N	BUY	Air	26
90	**Cryptococcus curvatus B**	N/A	N/A	N	BUY	Air	26
91	**Cryptococcus dimennae**	N/A	N/A	N	BUY	Air	26
92	**Cryptococcus gastricus**	N/A	N/A	N	BUY	Air	26
93	**Cryptococcus kuetzingii**	N/A	N/A	N	BUY	Air	26
94	**Cryptococcus laurentii**	N/A	N/A	N	BUY	Air	26
95	**Cryptococcus luteolus**	N/A	N/A	N	BUY	Air	26
96	**Cryptococcus macerans**	N/A	N/A	N	BUY	Air	26
97	**Cryptococcus magnus**	N/A	N/A	N	BUY	Air	26
98	**Cryptococcus magnus var aerius**	N/A	N/A	N	BUY	Air	26
99	**Cryptococcus marinus**	N/A	N/A	N	BUY	Air	26
100	**Cryptococcus skinneri**	N/A	N/A	N	BUY	Air	26
101	**Cryptococcus terreus A**	N/A	N/A	N	BUY	Air	26
102	**Cryptococcus terreus B**	N/A	N/A	N	BUY	Air	26
103	**Cryptococcus tsukubaensis**	N/A	N/A	N	BUY	Air	26
104	**Debaryomyces castellii**	N/A	N/A	N	BUY	Air	26
105	**Debaryomyces hansenii A**	N/A	N/A	N	BUY	Air	26
106	**Debaryomyces hansenii B**	N/A	N/A	N	BUY	Air	26
107	**Debaryomyces hansenii C**	N/A	N/A	N	BUY	Air	26
108	**Debaryomyces hansenii var fabryi**	N/A	N/A	N	BUY	Air	26
109	**Debaryomyces maramus**	N/A	N/A	N	BUY	Air	26
110	**Debaryomyces polymorphus**	N/A	N/A	N	BUY	Air	26
111	**Debaryomyces vanrijiae**	N/A	N/A	N	BUY	Air	26
112	**Dekkera anomala**	N/A	N/A	N	BUY	Air	26
113	**Dekkera bruxellensis A**	N/A	N/A	N	BUY	Air	26
114	**Dekkera bruxellensis B**	N/A	N/A	N	BUY	Air	26
115	**Dekkera custersiana**	N/A	N/A	N	BUY	Air	26
116	**Dekkera naardenensis**	N/A	N/A	N	BUY	Air	26
117	**Dipodascus capitatus**	N/A	N/A	N	BUY	Air	26
118	**Dipodascus ovetensis**	N/A	N/A	N	BUY	Air	26
119	**Endomyces fibuliger**	N/A	N/A	N	BUY	Air	26
120	**Endomycopsella vivi**	N/A	N/A	N	BUY	Air	26
121	**Eremothecium ashbyi**	N/A	N/A	N	BUY	Air	26
122	**Fellomyces fuzhouensis**	N/A	N/A	N	BUY	Air	26
123	**Filobasidiella neoformans bacillisporus**	N/A	N/A	N	BUY	Air	26
124	**Filobasidiella neoformans neoformans A**	N/A	N/A	N	BUY	Air	26
125	**Filobasidiella neoformans neoformans B**	N/A	N/A	N	BUY	Air	26
126	**Filobasidium uniguttulatum**	N/A	N/A	N	BUY	Air	26
127	**Galactomyces geotrichum**	N/A	N/A	N	BUY	Air	26
128	**Geotrichum terrestre**	N/A	N/A	N	BUY	Air	26
129	**Guilliermondella selenospora**	N/A	N/A	N	BUY	Air	26
130	**Hanseniaspora guilliermondii/uvarum/valb**	N/A	N/A	N	BUY	Air	26
131	**Hanseniaspora occidentalis**	N/A	N/A	N	BUY	Air	26
132	**Hanseniaspora osmophila/vineae**	N/A	N/A	N	BUY	Air	26
133	**Hyphopichia burtonii A**	N/A	N/A	N	BUY	Air	26
134	**Hyphopichia burtonii B**	N/A	N/A	N	BUY	Air	26

	Species Name	Type	Test	Thio	Medium	Atm	Temp
135	**Hyphopichia burtonii C**	N/A	N/A	N	BUY	Air	26
136	**Issatchenkia orientalis**	N/A	N/A	N	BUY	Air	26
137	**Issatchenkia scutulata**	N/A	N/A	N	BUY	Air	26
138	**Issatchenkia scutulata var exigua**	N/A	N/A	N	BUY	Air	26
139	**Issatchenkia scutulata var scutula**	N/A	N/A	N	BUY	Air	26
140	**Kluyveromyces delphensis**	N/A	N/A	N	BUY	Air	26
141	**Kluyveromyces lactis**	N/A	N/A	N	BUY	Air	26
142	**Kluyveromyces lodderae**	N/A	N/A	N	BUY	Air	26
143	**Kluyveromyces marxianus**	N/A	N/A	N	BUY	Air	26
144	**Kluyveromyces thermotolerans**	N/A	N/A	N	BUY	Air	26
145	**Kluyveromyces wickerhamii**	N/A	N/A	N	BUY	Air	26
146	**Kurtzmanomyces nectairei**	N/A	N/A	N	BUY	Air	26
147	**Lodderomyces elongisporus**	N/A	N/A	N	BUY	Air	26
148	**Metschnikowia pulcherrima**	N/A	N/A	N	BUY	Air	26
149	**Metschnikowia reukaufii**	N/A	N/A	N	BUY	Air	26
150	**Metschnikowia zobellii**	N/A	N/A	N	BUY	Air	26
151	**Nadsonia fulvescens**	N/A	N/A	N	BUY	Air	26
152	**Pachysolen tannophilus**	N/A	N/A	N	BUY	Air	26
153	**Phaffia rhodozyma**	N/A	N/A	N	BUY	Air	26
154	**Pichia alni**	N/A	N/A	N	BUY	Air	26
155	**Pichia amenthionina var amethonina**	N/A	N/A	N	BUY	Air	26
156	**Pichia amenthionina var pachy**	N/A	N/A	N	BUY	Air	26
157	**Pichia amylophila/mississippiensis**	N/A	N/A	N	BUY	Air	26
158	**Pichia angusta**	N/A	N/A	N	BUY	Air	26
159	**Pichia anomala**	N/A	N/A	N	BUY	Air	26
160	**Pichia bispora**	N/A	N/A	N	BUY	Air	26
161	**Pichia canadensis**	N/A	N/A	N	BUY	Air	26
162	**Pichia carsonii**	N/A	N/A	N	BUY	Air	26
163	**Pichia etchellsii**	N/A	N/A	N	BUY	Air	26
164	**Pichia fabianii**	N/A	N/A	N	BUY	Air	26
165	**Pichia farinosa/muscicola**	N/A	N/A	N	BUY	Air	26
166	**Pichia fermentans**	N/A	N/A	N	BUY	Air	26
167	**Pichia fluxuum**	N/A	N/A	N	BUY	Air	26
168	**Pichia glucozyma/methanolica**	N/A	N/A	N	BUY	Air	26
169	**Pichia guilliermondii A**	N/A	N/A	N	BUY	Air	26
170	**Pichia guilliermondii B**	N/A	N/A	N	BUY	Air	26
171	**Pichia haplophila**	N/A	N/A	N	BUY	Air	26
172	**Pichia holstii**	N/A	N/A	N	BUY	Air	26
173	**Pichia jadinii**	N/A	N/A	N	BUY	Air	26
174	**Pichia kluyveri**	N/A	N/A	N	BUY	Air	26
175	**Pichia media**	N/A	N/A	N	BUY	Air	26
176	**Pichia membranaefaciens**	N/A	N/A	N	BUY	Air	26
177	**Pichia mexicana**	N/A	N/A	N	BUY	Air	26
178	**Pichia minuta**	N/A	N/A	N	BUY	Air	26
179	**Pichia muscicola**	N/A	N/A	N	BUY	Air	26
180	**Pichia norvegensis**	N/A	N/A	N	BUY	Air	26
181	**Pichia ohmeri A**	N/A	N/A	N	BUY	Air	26
182	**Pichia ohmeri B**	N/A	N/A	N	BUY	Air	26
183	**Pichia onychis**	N/A	N/A	N	BUY	Air	26
184	**Pichia opuntiae**	N/A	N/A	N	BUY	Air	26
185	**Pichia pastoris**	N/A	N/A	N	BUY	Air	26
186	**Pichia petersonii**	N/A	N/A	N	BUY	Air	26
187	**Pichia pijperi**	N/A	N/A	N	BUY	Air	26
188	**Pichia pini**	N/A	N/A	N	BUY	Air	26
189	**Pichia rabaulensis**	N/A	N/A	N	BUY	Air	26
190	**Pichia rhodanensis**	N/A	N/A	N	BUY	Air	26
191	**Pichia silvicola**	N/A	N/A	N	BUY	Air	26
192	**Pichia spartinae**	N/A	N/A	N	BUY	Air	26
193	**Pichia stipitis**	N/A	N/A	N	BUY	Air	26
194	**Pichia subpelliculosa**	N/A	N/A	N	BUY	Air	26
195	**Pichia sydowiorum**	N/A	N/A	N	BUY	Air	26
196	**Pichia thermotolerans**	N/A	N/A	N	BUY	Air	26
197	**Pichia toletana**	N/A	N/A	N	BUY	Air	26
198	**Pichia trehalophila**	N/A	N/A	N	BUY	Air	26
199	**Pichia triangularis**	N/A	N/A	N	BUY	Air	26
200	**Rhodosporidium diobovatum**	N/A	N/A	N	BUY	Air	26
201	**Rhodosporidium sphaerocarpum**	N/A	N/A	N	BUY	Air	26
202	**Rhodosporidium toruloides**	N/A	N/A	N	BUY	Air	26

	Species Name	Type	Test	Thio	Medium	Atm	Temp
203	**Rhodotorula acheniorum**	N/A	N/A	N	BUY	Air	26
204	**Rhodotorula acuta**	N/A	N/A	N	BUY	Air	26
205	**Rhodotorula araucariae**	N/A	N/A	N	BUY	Air	26
206	**Rhodotorula aurantiaca A**	N/A	N/A	N	BUY	Air	26
207	**Rhodotorula aurantiaca B**	N/A	N/A	N	BUY	Air	26
208	**Rhodotorula bacarum**	N/A	N/A	N	BUY	Air	26
209	**Rhodotorula glutinis**	N/A	N/A	N	BUY	Air	26
210	**Rhodotorula glutinis var glutinis**	N/A	N/A	N	BUY	Air	26
211	**Rhodotorula graminis**	N/A	N/A	N	BUY	Air	26
212	**Rhodotorula hylophila**	N/A	N/A	N	BUY	Air	26
213	**Rhodotorula minuta**	N/A	N/A	N	BUY	Air	26
214	**Rhodotorula minuta var minuta**	N/A	N/A	N	BUY	Air	26
215	**Rhodotorula mucilaginosa**	N/A	N/A	N	BUY	Air	26
216	**Rhodotorula muscorum**	N/A	N/A	N	BUY	Air	26
217	**Rhodotorula philyla**	N/A	N/A	N	BUY	Air	26
218	**Rhodotorula pustula**	N/A	N/A	N	BUY	Air	26
219	**Saccharomyces bayanus**	N/A	N/A	N	BUY	Air	26
220	**Saccharomyces boulardii**	N/A	N/A	N	BUY	Air	26
221	**Saccharomyces cerevisiae A/Tor.pretorien**	N/A	N/A	N	BUY	Air	26
222	**Saccharomyces cerevisiae B**	N/A	N/A	N	BUY	Air	26
223	**Saccharomyces dairensis**	N/A	N/A	N	BUY	Air	26
224	**Saccharomycodes ludwigii**	N/A	N/A	N	BUY	Air	26
225	**Saccharomycopsis capsularis**	N/A	N/A	N	BUY	Air	26
226	**Saturnospora dispora**	N/A	N/A	N	BUY	Air	26
227	**Schizoblastosporon starkeyi-henricii**	N/A	N/A	N	BUY	Air	26
228	**Schizosaccharomyces japonicus**	N/A	N/A	N	BUY	Air	26
229	**Schizosaccharomyces japonicus var japoni**	N/A	N/A	N	BUY	Air	26
230	**Schizosaccharomyces octosporus**	N/A	N/A	N	BUY	Air	26
231	**Schizosaccharomyces pombe**	N/A	N/A	N	BUY	Air	26
232	**Schizosaccharomyces pombe var malidevora**	N/A	N/A	N	BUY	Air	26
233	**Schwanniomyces occidentalis**	N/A	N/A	N	BUY	Air	26
234	**Sporidiobolus johnsonii A**	N/A	N/A	N	BUY	Air	26
235	**Sporidiobolus johnsonii B**	N/A	N/A	N	BUY	Air	26
236	**Sporidiobolus johnsonii C**	N/A	N/A	N	BUY	Air	26
237	**Sporidiobolus pararoseus A**	N/A	N/A	N	BUY	Air	26
238	**Sporidiobolus pararoseus B**	N/A	N/A	N	BUY	Air	26
239	**Sporobolomyces albo-rubescens**	N/A	N/A	N	BUY	Air	26
240	**Sporopachydermia cereana**	N/A	N/A	N	BUY	Air	26
241	**Sporopachydermia lactativora**	N/A	N/A	N	BUY	Air	26
242	**Stephanoascus ciferrii**	N/A	N/A	N	BUY	Air	26
243	**Sterigmatomyces elviae**	N/A	N/A	N	BUY	Air	26
244	**Sterigmatomyces halophilus**	N/A	N/A	N	BUY	Air	26
245	**Torulaspora delbrueckii**	N/A	N/A	N	BUY	Air	26
246	**Torulaspora globosa**	N/A	N/A	N	BUY	Air	26
247	**Trichosporon beigelii A**	N/A	N/A	N	BUY	Air	26
248	**Trichosporon beigelii B**	N/A	N/A	N	BUY	Air	26
249	**Trichosporon brassicae**	N/A	N/A	N	BUY	Air	26
250	**Trichosporon inkin**	N/A	N/A	N	BUY	Air	26
251	**Trigonopsis triangularis/variabilis**	N/A	N/A	N	BUY	Air	26
252	**Ustilago maydis**	N/A	N/A	N	BUY	Air	26
253	**Wickerhamiella domercqiae**	N/A	N/A	N	BUY	Air	26
254	**Williopsis californica**	N/A	N/A	N	BUY	Air	26
255	**Williopsis saturnus**	N/A	N/A	N	BUY	Air	26
256	**Williopsis saturnus var mrakii**	N/A	N/A	N	BUY	Air	26
257	**Williopsis saturnus var saturnus**	N/A	N/A	N	BUY	Air	26
258	**Wingea robertsiae**	N/A	N/A	N	BUY	Air	26
259	**Yarrowia lipolytica**	N/A	N/A	N	BUY	Air	26
260	**Zygoascus hellenicus**	N/A	N/A	N	BUY	Air	26
261	**Zygosaccharomyces bailii**	N/A	N/A	N	BUY	Air	26
262	**Zygosaccharomyces bisporus**	N/A	N/A	N	BUY	Air	26
263	**Zygosaccharomyces cidri**	N/A	N/A	N	BUY	Air	26
264	**Zygosaccharomyces fermentati**	N/A	N/A	N	BUY	Air	26
265	**Zygosaccharomyces florentinus**	N/A	N/A	N	BUY	Air	26
266	**Zygosaccharomyces microellipsoides/mraki**	N/A	N/A	N	BUY	Air	26
267	**Zygosaccharomyces rouxii**	N/A	N/A	N	BUY	Air	26

Filamentous Fungi (and select Yeasts)

	Species Name	Type	Medium	Atm	Temp	Photo
1	**Absidia californica** J.Ellis & Hesseltine	FF-AIR	2%ME	Air	26	Mm
2	**Absidia corymbifera** (Cohn) Sacc. & Trotter	FF-AIR, FOOD	2%ME	Air	26	
3	**Absidia clindrospora var clindrospors** Hagen	FF-AIR	2%ME	Air	26	m
4	**Absidia glauca** Hagen	FF-AIR	2%ME	Air	26	Mm
5	**Absidia spinosa var spinosa** Lendner	FF-AIR	2%ME	Air	26	
6	**Acremonium atrogrisum** (Panasenko) W. Gams	FF-AIR	2%ME	Air	26	M
7	**Acremonium bacillisporum** (Onions & Barron) W.Gams	FF-AIR	2%ME	Air	26	M
8	**Acremonium berkeleyanum** (P. Karsten) W. Gams	FF-FOOD	2%ME	Air	26	M
9	**Acremonium breve** (Sukapure & Thirumalachar) W. Gams BGA	FF-AIR	2%ME	Air	26	M
10	**Acremonium breve** (Sukapure & Thirumalachar) W. Gams BGB	FF-AIR	2%ME	Air	26	M
11	**Acremonium charticola** (Lindau) W. Gams	FF-AIR, FOOD	2%ME	Air	26	M
12	**Acremonium furcatum** (F. & V. Moreau) ex W. Gams	FF-AIR	2%ME	Air	26	M
13	**Acremonium fusidioides** (Nicot) W.Gams	FF-AIR	2%ME	Air	26	M
14	**Acremonium hyalinulum**	FF-AIR	2%ME	Air	26	
15	**Acremonium kiliense** Gruetz	FF-AIR	2%ME	Air	26	M
16	**Acremonium murorum var felinum** (Marchal) S. Hughes	FF-AIR	2%ME	Air	26	M
17	**Acremonium murorum var murorum** (Corda) W. Gams	FF-AIR	2%ME	Air	26	
18	**Acremonium polychromum** (v. Beyma) W. Gams	FF-AIR	2%ME	Air	26	
19	**Acremonium potronii** Vuill.	FF-AIR	2%ME	Air	26	M
20	**Acremonium strictum** W. Gams BGA	FF-AIR, FOOD	2%ME	Air	26	M
21	**Acremonium strictum** W. Gams BGB	FF-AIR, FOOD	2%ME	Air	26	M
22	**Acrodontium crateriforme** (van Beyma) de Hoog	FF-AIR	2%ME	Air	26	M
23	**Acrodontium griseum** (Fassatiova') de Hoog	FF-AIR	2%ME	Air	26	
24	**Acrodontium salmoneum** de Hoog BGA	FF-AIR	2%ME	Air	26	M
25	**Acrodontium salmoneum** de Hoog BGB	FF-AIR	2%ME	Air	26	M
26	**Acrodontium simplex** (Mangenot) de Hoog	FF-AIR	2%ME	Air	26	M
27	**Actinomucor elegans** (Eidam) C.R. Benjamin & Hesseltine BGA	FF-AIR	2%ME	Air	26	Mm
28	**Actinomucor elegans** (Eidam) C.R. Benjamin & Hesseltine BGB	FF-AIR	2%ME	Air	26	Mm
29	**Alternaria alternata** (Fr.) Keissl	FF-AIR, FOOD	2%ME	Air	26	Mm
30	**Amorphotheca resinae** D. Parbery	FF-AIR	2%ME	Air	26	M
31	**Aphanocladium album** (Preuss) W. Gams	FF-AIR	2%ME	Air	26	M
32	**Apiospora montagnei** Sacc.	FF-AIR	2%ME	Air	26	M
33	**Arthrinium phacospermum** (Corda) M.B. Ellis	FF-AIR, FOOD	2%ME	Air	26	M
34	**Aspergillus aculeatus** Izuka	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
35	**Aspergillus aeneus** Sappa	FF-ASP	2%ME	Air	26	M
36	**Aspergillus asperescens** Stolk	FF-AIR, ASP	2%ME	Air	26	Mm
37	**Aspergillus aureolatus** Muntanola-Cvctkovic & Bata BGA	FF-AIR, ASP	2%ME	Air	26	Mm
38	**Aspergillus aureolatus** Muntanola-Cvctkovic & Bata BGB	FF-AIR, ASP	2%ME	Air	26	Mm
39	**Aspergillus auricomus** (Guegen) Saito	FF-ASP	2%ME	Air	26	Mm
40	**Aspergillus avenaceus** G. Smith	FF-ASP	2%ME	Air	26	M
41	**Aspergillus awamori** Nakazawa	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
42	**Aspergillus brevipes** G.Smith	FF-ASP	2%ME	Air	26	M
43	**Aspergillus caesiellus** Saito	FF-AIR, ASP	2%ME	Air	26	Mm
44	**Aspergillus caespitosus** Raper & Thom	FF-ASP	2%ME	Air	26	M
45	**Aspergillus candidus** Link BGA	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
46	**Aspergillus candidus** Link BGB	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
47	**Aspergillus carbonarius** (Bainier) Thom	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
48	**Aspergillus carneus** (V. Tiegham) Blockwitz	FF-AIR, ASP	2%ME	Air	26	Mm
49	**Aspergillus cervinus** Massee	FF-ASP	2%ME	Air	26	M
50	**Aspergillus clavatus** Desm.	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
51	**Aspergillus egyptiacus** Moubasher & Moustafa	FF-ASP	2%ME	Air	26	M
52	**Aspergillus elegans** Gasperini	FF-AIR, ASP	2%ME	Air	26	Mm
53	**Aspergillus flavofurcatus** Batista & Maia	FF-ASP	2%ME	Air	26	Mm
54	**Aspergillus flavus var flavus** Link	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
55	**Aspergillus foetidus** Thom & Raper	FF-ASP	2%ME	Air	26	M
56	**Aspergillus fresenii** Subramanian	FF-AIR, ASP	2%ME	Air	26	Mm
57	**Aspergillus fumigatus** Fresen.	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
58	**Aspergillus furniculosus** G. Smith	FF-ASP	2%ME	Air	26	M
59	**Aspergillus giganteus** Wehmer	FF-AIR, ASP	2%ME	Air	26	Mm
60	**Aspergillus japonicus var japonicus** K. Saito	FF-AIR, ASP	2%ME	Air	26	Mm
61	**Aspergillus kanagawaensis** Nehira BGA	FF-ASP	2%ME	Air	26	M
62	**Aspergillus kanagawaensis** Nehira BGB	FF-ASP	2%ME	Air	26	M
63	**Aspergillus lanosus** Kamal & Bhargava	FF-ASP	2%ME	Air	26	M
64	**Aspergillus malignus** Lindt	FF-ASP	2%ME	Air	26	M

M *Indicates that a Macroscopic photo is present in Biolog's photo library.*
m *Indicates that a Microscopic photo is present in Biolog's photo library.*

	Species Name	Type	Medium	Atm	Temp	Photo
65	**Aspergillus niger** v. Tiegham BGA	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
66	**Aspergillus niger** v. Tiegham BGB	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
67	**Aspergillus nutans** Mclennan & Ducker	FF-ASP	2%ME	Air	26	Mm
68	**Aspergillus ochraceus** K. Wilhelm BGA	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
69	**Aspergillus ochraceus** K. Wilhelm BGB	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
70	**Aspergillus oryzae var oryzae** (Ahlburg) Cohn	FF-AIR, FOOD	2%ME	Air	26	Mm
71	**Aspergillus ostianus** Wehmer	FF-AIR, ASP	2%ME	Air	26	Mm
72	**Aspergillus pallidus** Kamyschko	FF-ASP	2%ME	Air	26	Mm
73	**Aspergillus parasiticus** Speare BGA	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
74	**Aspergillus parasiticus** Speare BGB	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
75	**Aspergillus parvulus** G. Sm. BGA	FF-ASP	2%ME	Air	26	M
76	**Aspergillus parvulus** G. Sm. BGB	FF-ASP	2%ME	Air	26	M
77	**Aspergillus penicilliformis** Kamyschko	FF-ASP	2%ME	Air	26	M
78	**Aspergillus petrakii** Voros	FF-ASP	2%ME	Air	26	M
79	**Aspergillus phoenicis** (Corda) Thom	FF-ASP	2%ME	Air	26	M
80	**Aspergillus proliferans** G. Smith	FF-ASP	2%ME	Air	26	M
81	**Aspergillus pulverulentus** (McAlp.) Thom	FF-ASP	2%ME	Air	26	Mm
82	**Aspergillus puniceus** Kwon & Fennell	FF-AIR, ASP	2%ME	Air	26	Mm
83	**Aspergillus raperi** Stolk & J.A. Meyer	FF-AIR, ASP	2%ME	Air	26	M
84	**Aspergillus restrictus** G. Smith	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
85	**Aspergillus sclerotiorum** Huber	FF-AIR, ASP	2%ME	Air	26	Mm
86	**Aspergillus sepultus** Tuthill & Christensen	FF-ASP	2%ME	Air	26	M
87	**Aspergillus sparsus** Raper & Thom	FF-ASP	2%ME	Air	26	M
88	**Aspergillus speluneus** Raper & Fennell	FF-ASP	2%ME	Air	26	Mm
89	**Aspergillus sydowii** (Brainier & Sartory) Thom & Church	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
90	**Aspergillus tamarii** Kita	FF-FOOD, ASP	2%ME	Air	26	M
91	**Aspergillus terreus var africanus** Fennell & Rapier	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
92	**Aspergillus terreus var terreus** Thom	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
93	**Aspergillus terricola var americanus** Marchal	FF-AIR, FOOD, ASP	2%ME	Air	26	m
94	**Aspergillus terricola var terricola** Marchal	FF-AIR, FOOD, ASP	2%ME	Air	26	m
95	**Aspergillus ustus** (Bainier) Thom & Church	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
96	**Aspergilus versicolor** (Vuill.) Tirab.	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
97	**Aspergillus violaceofuscus** Gasperini	FF-ASP	2%ME	Air	26	m
98	**Aspergillus wentii** Wermer	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
99	**Aspergillus zonatus** Zonatus	FF-ASP	2%ME	Air	26	M
100	**Aureobasidium pullulans var melanigenum** (de Barry) G. Arnaud	FF-AIR, FOOD	2%ME	Air	26	M
101	**Aureobasidium pullulans var pullulans** (de Barry) G. Arnaud	FF-AIR, FOOD	2%ME	Air	26	Mm
102	**Basipetospora halophila** (J.F.H. Beyma) Pitt & A.D. Hocking	FF-FOOD	2%ME	Air	26	M
103	**Beauveria bassiana**	FF-AIR	2%ME	Air	26	M
104	**Blastobotrys elegans** de Hoog et al. BGA	FF-AIR	2%ME	Air	26	M
105	**Blastobotrys elegans** de Hoog et al. BGB	FF-AIR	2%ME	Air	26	M
106	**Botryosporium longibrachiatum** (Oud.) Maire	FF-AIR	2%ME	Air	26	M
107	**Botrytis aclada** Fresen.	FF-AIR, FOOD	2%ME	Air	26	Mm
108	**Botrytis cinerea** Pers. BGA	FF-AIR, FOOD	2%ME	Air	26	Mm
109	**Botrytis cinerea** Pers. BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
110	**Bulleromyces albus**	FF-AIR, YST	2%ME	Air	26	Mm
111	**Byssochlamys fulva** Olliver & G. Smith BGA	FF-AIR, FOOD	2%ME	Air	26	M
112	**Byssochlamys fulva** Olliver & G. Smith BGB	FF-AIR, FOOD	2%ME	Air	26	M
113	**Byssochlamys nivea** Westling	FF-AIR, FOOD	2%ME	Air	26	M
114	**Candida albicans** (Robin) Berkhout	FF-YST	2%ME	Air	26	
115	**Candida guilliermondii** (Castellani) Langeron & Guerra Kodamaea ohmeri) (teleo. Kodamaea ohmeri)	FF-FOOD, YST	2%ME	Air	26	
116	**Candida insectorum** D.B. Scott et al.	FF-YST	2%ME	Air	26	
117	**Candida intermedia**(AS) (Ciferri & Ashford) Langeron & Guerra	FF-FOOD, YST	2%ME	Air	26	Mm
118	**Candida montana** S. Goto & Oguri	FF-YST	2%ME	Air	26	
119	**Candida parapsilosis** (Ashford) Langeron & Talice	FF-FOOD, YST	2%ME	Air	26	M
120	**Candida rugosa** (H.W. Anderson) Didddens & Lodder	FF-YST	2%ME	Air	26	
121	**Candida sake** (Saito & Oda) v. Uden & Buckley	FF-FOOD, YST	2%ME	Air	26	Mm
122	**Candida sorbophila** (Nakase) S.A. Meyer & Yarrow	FF-YST	2%ME	Air	26	
123	**Candida zeylanoides** (Castellani) Langeron & Guerra	FF-FOOD, YST	2%ME	Air	26	Mm
124	**Cephaliophora tropica** Thaxler	FF-AIR	2%ME	Air	26	Mm
125	**Cerinosterus cyanesens** (de Hoog & de Vries) R.T. Moore	FF-AIR	2%ME	Air	26	
126	**Chaetomium funicola** Cooke	FF-FOOD	2%ME	Air	26	
127	**Chaetomium globosum** Kunze: Fries	FF-AIR, FOOD	2%ME	Air	26	M
128	**Chaetosartorya stromatoides** Wiley & Simmons	FF-ASP	2%ME	Air	26	M
129	**Chrysosporium indicum** (Randhawa & Sandhu) Garg (anam. Aspergillus stromatoides)	FF-AIR	2%ME	Air	26	M

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	Species Name	Type	Medium	Atm	Temp	Photo
130	**Chrysosporium inops** J.W. Carmich.	FF-FOOD	2%ME	Air	26	M
131	**Chrysosporium keratinophilum** D.Frey ex Charmichael	FF-FOOD	2%ME	Air	26	
132	**Chrysosporium merdarium** (Link: Fries) Carmichael.	FF-AIR	2%ME	Air	26	
133	**Chrysosporium pannicola** (Corda) van Oorschot & Stalpers	FF-AIR	2%ME	Air	26	
134	**Cladosporium cladosporiodes** (Fresen.) G.A. de Vries	FF-AIR, FOOD	2%ME	Air	26	Mm
135	**Cladosporium herbarum** (Pers.) Link BGA	FF-AIR, FOOD	2%ME	Air	26	Mm
136	**Cladosporium herbarum** (Pers.) Link BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
137	**Cladosporium macrocarpum** Preuss	FF-AIR, FOOD	2%ME	Air	26	M
138	**Cladosporium sphaerospermum** Penz. BGA	FF-AIR, FOOD	2%ME	Air	26	Mm
139	**Cladosporium sphaerospermum** Penz. BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
140	**Cladosporium tenuissium** Cooke	FF-AIR	2%ME	Air	26	M
141	**Clonostachys rosea** (Link: Fr.) Schroers, Samuels, Seifert & W. Gams	FF-AIR	2%ME	Air	26	Mm
142	**Colletotrichum acutatum** Simmonds	FF-COL	2%ME	Air	26	m
143	**Colletotrichum capsici** (H. Sydow) E. Butler & Bisby	FF-COL	2%ME	Air	26	
144	**Colletotrichum coccodes** (Wallroth) Hughes	FF-COL	2%ME	Air	26	
145	**Colletotrichum coffeanum** Noack sensu Hindorf	FF-COL	2%ME	Air	26	
146	**Colletotrichum crassipes** (Spegazzini) von Arx	FF-COL	2%ME	Air	26	
147	**Colletotrichum dematium** (Persoon: Fries) Grove	FF-COL	2%ME	Air	26	
148	**Colletotrichum destructivum** O'Gara	FF-COL	2%ME	Air	26	
149	**Colletotrichum gloeosporiodes** (Penzig) Penzig & Saccardo	FF-FOOD, COL	2%ME	Air	26	M
150	**Colletotrichum lindenuthianum** (Saccardo & Magnus) Briosi	FF-COL	2%ME	Air	26	
151	**Colletotrichum trichellum** (Fries) Duke	FF-COL	2%ME	Air	26	
152	**Colletotrichum trifolii** Bain & Essary	FF-COL	2%ME	Air	26	
153	**Colletotrichum truncatum** (Schweinitz) Andrus & Moore BGA	FF-COL	2%ME	Air	26	
154	**Colletotrichum truncatum** (Schweinitz) Andrus & Moore BGB	FF-COL	2%ME	Air	26	
155	**Cryptococcus albidus var albidus** (Saito) Skinner	FF-FOOD, YST	2%ME	Air	26	Mm
156	**Cryptococcus laurentii var laurentii** (Kufferath) Skinner	FF-FOOD, YST	2%ME	Air	26	Mm
157	**Cryptococcus terreus** di Menna	FF-YST	2%ME	Air	26	
158	**Cunninghamella elegans** Lendner	FF-AIR, FOOD	2%ME	Air	26	
159	**Curvularia lunata var lunata** (Wakker) Boedijn BGA	FF-AIR, FOOD	2%ME	Air	26	Mm
160	**Curvularia lunata var lunata** (Wakker) Boedijn BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
161	**Debaryomyces castellii** Capriotti	FF-YST	2%ME	Air	26	
162	**Debaryomyces hansenii var hansenii** (Zopl) Lodder & Kreger-v.Rij BGA (anam. CANADA FAMATA)	FF-FOOD, YST	2%ME	Air	26	Mm
163	**Debaryomyces hansenii var hansenii** (Zopl) Lodder & Kreger-v.Rij BGB (anam. CANADA FAMATA)	FF-FOOD, YST	2%ME	Air	26	Mm
164	**Debaryomyces hansenii var hansenii** (Zopl) Lodder & Kreger-v.Rij BGC (anam. CANADA FAMATA)	FF-FOOD, YST	2%ME	Air	26	Mm
165	**Debaryomyces hansenii var hansenii** (Zopl) Lodder & Kreger-v.Rij BGD (anam. CANADA FAMATA)	FF-FOOD, YST	2%ME	Air	26	Mm
166	**Debaryomyces occidentalis var occidentalis** (Klocker) Kurtzman & Robnett	FF-YST	2%ME	Air	26	
167	**Debaryomyces polymorphus var polymorphus** (Klocker) C.W. Price & Phaff	FF-YST	2%ME	Air	26	
168	**Dekkera bruxellensis** van der Walt (anam. Brettanomyces bruxellensis)	FF-FOOD, YST	2%ME	Air	26	Mm
169	**Doratomyces microsporus** (Sacc.) Morton & G. Smith	FF-AIR	2%ME	Air	26	M
170	**Doratomyces stemonitis** (Pers.:Fr) Morton & G. Smith	FF-AIR	2%ME	Air	26	M
171	**Emericella fruticulosa** (Raper & Fennel) Malloch & Cain (anam.Aspergillus truticans)	FF-ASP	2%ME	Air	26	M
172	**Emericella nidulans var nidulans** (Eidam) Vuillemin (anam. Aspergillus nidulellus)	FF-AIR, FOOD, ASP	2%ME	Air	26	M
173	**Emericella quadrilineata** (Thom & Raper) C.R. Benjamin (anam. Aspergillus tetrazonus)	FF-ASP	2%ME	Air	26	M
174	**Emericella rugulosa** (Thom & Raper) C.R. Benjamin (anam. Aspergillus rugulovalvus)	FF-ASP	2%ME	Air	26	M
175	**Emericella striata** (J.N. Rai et al.) Malloch & Cain (anam. Aspergillus striatulus)	FF-ASP	2%ME	Air	26	M
176	**Emericella unguis** Malloch & Cain BGA (anam. Aspergillus unguis)	FF-ASP	2%ME	Air	26	M
177	**Emericella unguis** Malloch & Cain BGB (anam. Aspergillus unguis)	FF-ASP	2%ME	Air	26	M
178	**Emericella variecolor var variecolor** Berk. & Br. In Berk. (anam. Aspergillus stellifer)	FF-ASP	2%ME	Air	26	M
179	**Emericella violacea** (Fennell & Raper) Malloch & Cain (anam. Aspergillus violaccobrunneus)	FF-ASP	2%ME	Air	26	M
180	**Endomyces fibuliger** Lindner	FF-AIR, FOOD, YST	2%ME	Air	26	Mm
181	**Engyodontium album** (Limber) de Hoog	FF-AIR	2%ME	Air	26	M
182	**Epicoccum nigrum** (purapurascens) Link	FF-AIR	2%ME	Air	26	M
183	**Eremascus fertilis** Stoppel	FF-AIR, FOOD, YST	2%ME	Air	26	M
184	**Eupenicillium baarnense** (V.Beyma)Stolk&Scott (anam. Penicillium turbatum)	FF-PEN	2%ME	Air	26	M
185	**Eupenicillium brefeldianum** (Dodge)Stolk&Scott (anam. Penicillium dodgei)	FF-PEN	2%ME	Air	26	M

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186	**Eupenicillium cinnamorpurpureum** D.B. Scott & Stolk BGA (anam. Penicillium cinnamopurpureum)	FF-AIR, FOOD, PEN	2%ME	Air	26	M
187	**Eupenicillium cinnamorpurpureum** D.B. Scott & Stolk BGB (anam. Penicillium cinnamopurpureum)	FF-AIR, FOOD, PEN	2%ME	Air	26	M
188	**Eupenicillium crustaceum** Ludwig (anam. Penicillium nilense)	FF-AIR, PEN	2%ME	Air	26	M
189	**Eupenicillium euglaucum** (van Beyma) Stolk & Samson BGA (anam. Penicillium citreonigrum)	FF-PEN	2%ME	Air	26	Mm
190	**Eupenicillium euglaucum** (van Beyma) Stolk & Samson BGB (anam. Penicillium citreonigrum)	FF-PEN	2%ME	Air	26	Mm
191	**Eupenicillium javanicum var javanicum** (Van Beyma) Stolk & Scott (P. simplicissium p.p.)	FF-AIR, FOOD, PEN	2%ME	Air	26	M
192	**Eupenicillium lapidosum** Scott & Stolk (anam. Penicillium lapidosum)	FF-PEN	2%ME	Air	26	M
193	**Eupenicillium meridianum** Scott (anam. Penicillium decumbens)	FF-PEN	2%ME	Air	26	M
194	**Eupenicillium pinetorum** Stolk (anam. Penicillium fuscum)	FF-PEN	2%ME	Air	26	M
195	**Eurotium amstelodami** Mangin (anam. Aspergillus hollandicus)	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
196	**Eurotium chevalieri** L.Mangin BGA (anam. Aspergillus equitis)	FF-AIR, FOOD, ASP	2%ME	Air	26	M
197	**Eurotium chevalieri** L.Mangin BGB (anam. Aspergillus equitis)	FF-AIR, FOOD, ASP	2%ME	Air	26	M
198	**Eurotium echinulatum** Delacroix (anam. Aspergillus echinulatus)	FF-AIR, ASP	2%ME	Air	26	M
199	**Eurotium herbariorum** (Wiggers:Fr.) Link (anam. Aspergillus glaucus)	FF-AIR, FOOD, ASP	2%ME	Air	26	M
200	**Eurotium intermedium** Blaser (anam. Aspergillus intermedium)	FF-ASP	2%ME	Air	26	Mm
201	**Eurotium repens**	FF-AIR, FOOD, ASP	2%ME	Air	26	M
202	**Eurotium rubrum** Konig et al. (anam. Aspergillus rubrobrunneus)	FF-AIR, FOOD, ASP	2%ME	Air	26	Mm
203	**Eurotium spiculosum** Blaser BGA (anam. Aspergillus spiculosum)	FF-ASP	2%ME	Air	26	
204	**Eurotium spiculosum** Blaser BGB (anam. Aspergillus spiculosum)	FF-ASP	2%ME	Air	26	
205	**Fennellia flavipes** Wiley & Simmons (anam. Aspergillus flavipes)	FF-FOOD, ASP	2%ME	Air	26	M
206	**Fennellia nivea** (Wiley & Simmons) Samson BGA (anam. Aspergillus niveus)	FF-FOOD, ASP	2%ME	Air	26	M
207	**Fennellia nivea** (Wiley & Simmons) Samson BGB (anam. Aspergillus niveus)	FF-FOOD, ASP	2%ME	Air	26	M
208	**Fusarium acuminatum** Ellis & Everh. BGA (teleo. Gibberella acuminatum)	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
209	**Fusarium acuminatum** Ellis & Everh. BGB (teleo. Gibberella acuminatum)	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
210	**Fusarium annulatum** Bugnicourt	FF-FUS	2%ME	Air	26	M
211	**Fusarium avenaceum** (Corda:Fr.) Sacc. BGA (teleo. Gibberella avenacea)	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
212	**Fusarium avenaceum** (Corda:Fr.) Sacc. BGB (teleo. Gibberella avenacea)	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
213	**Fusarium avenaceum** (Corda:Fr.) Sacc. BGC (teleo. Gibberella avenacea)	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
214	**Fusarium avenaceum s sp aywerte** Sangalang & L.W. Burgess	FF-FUS	2%ME	Air	26	Mm
215	**Fusarium avenaceum s sp nurragai** Summerell & L.W. Burgess	FF-FUS	2%ME	Air	26	Mm
216	**Fusarium brevicatenulatum** Nirenberg, O'Donnell, Kroschel & Andrianairo	FF-FUS	2%ME	Air	26	M
217	**Fusarium camptoceras** Wollenw. & Reinking	FF-FUS	2%ME	Air	26	M
218	**Fusarium chlamydosporum var chlamydosporum** Wollenw. & Reinking	FF-AIR, FOOD, FUS	2%ME	Air	26	M
219	**Fusarium ciliatum** Link	FF-FUS	2%ME	Air	26	M
220	**Fusarium compactum** (Wollenw.) Raillo	FF-FUS	2%ME	Air	26	M
221	**Fusarium crookwellense** Burgess, Nelson & Toussoun BGA	FF-FUS	2%ME	Air	26	M
222	**Fusarium crookwellense** Burgess, Nelson & Toussoun BGB	FF-FUS	2%ME	Air	26	M
223	**Fusarium crookwellense** Burgess, Nelson & Toussoun BGC	FF-FUS	2%ME	Air	26	M
224	**Fusarium culmorum** (W.G. Smith) Sacc. BGA	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
225	**Fusarium culmorum** (W.G. Smith) Sacc. BGB	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
226	**Fusarium decemcellulare** Brick (teleo. Nectria rigidiuscula)	FF-FUS	2%ME	Air	26	M
227	**Fusarium equiseti** (Corda) Sacc. (teleo. Gibberella intricans)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
228	**Fusarium eumartii** Carpenter (teleo. Nectria haematococca)	FF-FUS	2%ME	Air	26	M
229	**Fusarium flocciferum** Corda (teleo. Gibberella heterochroma)	FF-FUS	2%ME	Air	26	M
230	**Fusarium fujikuroi** Nirenberg (teleo. Gibberella fujikuroi)	FF-FUS	2%ME	Air	26	M
231	**Fusarium globosum** Rheeder, Marasas & Nelson	FF-FUS	2%ME	Air	26	M
232	**Fusarium graminearum** Schwabe BGA (teleo. Gibberella zeae)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
233	**Fusarium graminearum** Schwabe BGB (teleo. Gibberella zeae)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
234	**Fusarium graminearum** Schwabe BGC (teleo. Gibberella zeae)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
235	**Fusarium graminearum** Schwabe BGD (teleo. Gibberella zeae)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
236	**Fusarium graminearum** Schwabe BGE (teleo. Gibberella zeae)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
237	**Fusarium graminum** Corda	FF-AIR, FOOD, FUS	2%ME	Air	26	M
238	**Fusarium heterosporum** Nees BGA (teleo. Gibberella gordonia)	FF-FUS	2%ME	Air	26	M
239	**Fusarium heterosporum** Nees BGB (teleo. Gibberella gordonia)	FF-FUS	2%ME	Air	26	M
240	**Fusarium heterosporum** Nees BGC (teleo. Gibberella gordonia)	FF-FUS	2%ME	Air	26	M
241	**Fusarium juruanum** P. Henn. (teleo. Nectria diplos)	FF-FUS	2%ME	Air	26	M
242	**Fusarium lactis** Pirotta & Riboni	FF-FUS	2%ME	Air	26	M
243	**Fusarium lateritium var lateritium** Nees (teleo. Gibberella baccata)	FF-FUS	2%ME	Air	26	M
244	**Fusarium longipes** Wollenw. & Reinking	FF-FOOD, FUS	2%ME	Air	26	Mm
245	**Fusarium melanochlorum** (Caspary) Sacc. (teleo. Nectria flavoviridis)	FF-FUS	2%ME	Air	26	M
246	**Fusarium merismoides** VAR MERISMOIDES Corda	FF-AIR, FUS	2%ME	Air	26	M

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247	**Fusarium oxysporum** Schlcct.:Fr. BGA	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
248	**Fusarium oxysporum** Schlcct.:Fr. BGB	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
249	**Fusarium pallidoroseum** (Cooke) Sacc.	FF-FUS	2%ME	Air	26	M
250	**Fusarium poae** (Peck) Wollenw. BGA	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
251	**Fusarium poae** (Peck) Wollenw. BGB	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
252	**Fusarium proliferatum var proliferatum** (Matsush.) Nirenberg BGA (teleo. Gibberella intermedia)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
253	**Fusarium proliferatum var proliferatum** (Matsush.) Nirenberg BGB (teleo. Gibberella intermedia)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
254	**Fusarium pseudoanthophilum** Nirenberg, O'Donnell & Mabatanhema	FF-FUS	2%ME	Air	26	M
255	**Fusarium pseudograminearum** Aoki & O'Donnell (teleo. Gibberella coronicola)	FF-FUS	2%ME	Air	26	M
256	**Fusarium ramigenum** O'Donnell & Nirenberg	FF-FUS	2%ME	Air	26	M
257	**Fusarium redolens** Wollenw.	FF-FUS	2%ME	Air	26	M
258	**Fusarium reticulatum** Mont. (teleo. Gibberella cyanea)	FF-FUS	2%ME	Air	26	M
259	**Fusarium robustum** Gerlach	FF-FUS	2%ME	Air	26	M
260	**Fusarium sacchari** (Butler) W. Gams BGA	FF-FOOD, FUS	2%ME	Air	26	M
261	**Fusarium sacchari** (Butler) W. Gams BGB	FF-FOOD, FUS	2%ME	Air	26	M
262	**Fusarium sambucinum var sambucinum** Fuckel (teleo. Gibberella pulicaris)	FF-FOOD, FUS	2%ME	Air	26	Mm
263	**Fusarium solani** (Mart.) Sacc. BGA	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
264	**Fusarium solani** (Mart.) Sacc. BGB	FF-AIR, FOOD, FUS	2%ME	Air	26	Mm
265	**Fusarium sporotrichioides var minus** Sherb. BGA	FF-AIR, FUS	2%ME	Air	26	Mm
266	**Fusarium sporotrichioides var minus** Sherb. BGB	FF-AIR, FUS	2%ME	Air	26	Mm
267	**Fusarium sporotrichioides var sporotrichioides** Sherb. BGA	FF-AIR, FUS	2%ME	Air	26	Mm
268	**Fusarium sporotrichioides var sporotrichioides** Sherb. BGB	FF-AIR, FUS	2%ME	Air	26	Mm
269	**Fusarium stilboides** Wollenw. BGA (teleo. Gibberella stilboides)	FF-FOOD,FUS	2%ME	Air	26	Mm
270	**Fusarium stilboides** Wollenw. BGB (teleo. Gibberella stilboides)	FF-FOOD,FUS	2%ME	Air	26	Mm
271	**Fusarium stilboides** Wollenw. BGC (teleo. Gibberella stilboides)	FF-FOOD,FUS	2%ME	Air	26	Mm
272	**Fusarium subglutinans** (Wollenw. & Reinking) P.E. Nelson et al. (teleo. Gibberella subglutinans)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
273	**Fusarium thapsinum** Klittich, Leslie, Nelson & Marasas (teleo. Gibberella thapsinum)	FF-FUS	2%ME	Air	26	M
274	**Fusarium torulosum** (Berk. & Curt.) Nirenberg	FF-FUS	2%ME	Air	26	M
275	**Fusarium tricinctum** (Corda) Sacc. BGA	FF-AIR, FOOD, FUS	2%ME	Air	26	M
276	**Fusarium tricinctum** (Corda) Sacc. BGB	FF-AIR, FOOD, FUS	2%ME	Air	26	M
277	**Fusarium tricinctum** (Corda) Sacc. BGC	FF-AIR, FOOD, FUS	2%ME	Air	26	M
278	**Fusarium tricinctum** (Corda) Sacc. BGD	FF-AIR, FOOD, FUS	2%ME	Air	26	M
279	**Fusarium tumidum** Scherbakoff (teleo. Gibberella tumida)	FF-FUS	2%ME	Air	26	M
280	**Fusarium udum** E. Butler	FF-FUS	2%ME	Air	26	M
281	**Fusarium venenatum** Nirenberg	FF-FUS	2%ME	Air	26	M
282	**Fusarium ventricosum** Appel & Wollenw.	FF-FUS	2%ME	Air	26	M
283	**Fusarium verticillioides** (Sacc.) Nirenberg BGA (teleo. Gibberella moniliformis)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
284	**Fusarium verticillioides** (Sacc.) Nirenberg BGB (teleo. Gibberella moniliformis)	FF-AIR, FOOD, FUS	2%ME	Air	26	M
285	**Fusarium xylarioides** Steyaert (teleo. Gibberella xylarioides)	FF-FUS	2%ME	Air	26	M
286	**Galactomyces geotrichum**(SS)(Butler & Perterson) Redhead & Malloch BGA (anam. Geotrichum candidum)	FF-AIR, FOOD, YST	2%ME	Air	26	M
287	**Galactomyces geotrichum**(SS)(Butler & Perterson) Redhead & Malloch BGB (anam. Geotrichum candidum)	FF-AIR, FOOD, YST	2%ME	Air	26	M
288	**Galactomyces geotrichum**(SS)(Butler & Perterson) Redhead & Malloch BGC (anam. Geotrichum candidum)	FF-AIR, FOOD, YST	2%ME	Air	26	M
289	**Galactomyces geotrichum**(SS)(Butler & Perterson) Redhead & Malloch BGD (anam. Geotrichum candidum)	FF-AIR, FOOD, YST	2%ME	Air	26	M
290	**Geomyces pannorum var pannorum** (Link) Sigler & Carmichael BGA	FF-AIR	2%ME	Air	26	M
291	**Geomyces pannorum var pannorum** (Link) Sigler & Carmichael BGB	FF-AIR	2%ME	Air	26	M
292	**Geomyces pulvereus** Hocking & Pitt	FF-AIR	2%ME	Air	26	
293	**Geosmithia putterilli** (Thom) Pitt	FF-FOOD, PEN	2%ME	Air	26	M
294	**Geotrichum klebahnii** (Stautz) Morenz	FF-AIR	2%ME	Air	26	
295	**Geotrichum sericeum** (Stautz) de Hoog et al.	FF-YST	2%ME	Air	26	
296	**Gibberella subglutinans** (Edwards) Nelson, Toussoun & Marasas (anam. Fusarium subglutinans)	FF-FUS	2%ME	Air	26	
297	**Gliocladium catenulatum** Gilman & Abbott	FF-AIR	2%ME	Air	26	M
298	**Gliocladium viride** Matruchot	FF-AIR	2%ME	Air	26	Mm
299	**Gonatobotrys simplex** Corda	FF-AIR	2%ME	Air	26	M
300	**Hanseniaspora uvarum** (Niehaus) El-Taby Shehata et al. (anam. Kloekera apiculata)	FF-FOOD, YST	2%ME	Air	26	Mm

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	Species Name	Type	Medium	Atm	Temp	Photo
301	**Hanseniaspora valbyensis** Kloecker (anam. Kloeckera japonica)	FF-FOOD, YST	2%ME	Air	26	Mm
302	**Hemicarpenteles paradoxus** Sarbhoy & Elphick (anam. Aspergillus paradoxus)	FF-ASP	2%ME	Air	26	M
303	**Hortaea werneckii** (Horta) Nishimura & Miyaji	FF-FOOD	2%ME	Air	26	
304	**Hyphopichia burtonii** (Boidin et al.) Arx & Van der Walt (anam. Candida chodatii)	FF-FOOD, YST	2%ME	Air	26	Mm
305	**Hypocrea andinensis** Samuels & O. Petrini	FF-TRI	2%ME	Air	26	M
306	**Hypocrea aurantia** P. Hennings	FF-TRI	2%ME	Air	26	M
307	**Hypocrea aureoviridis** Plowright &Cooke (anam. Trichoderma aureoviride)	FF-TRI	2%ME	Air	26	
308	**Hypocrea gelatinosa** (Tode: Fr.) Fr.	FF-TRI	2%ME	Air	26	M
309	**Hypocrea jecorina** Berk. & Broome BGA (anam. Trichoderma reesei)	FF-TRI	2%ME	Air	26	M
310	**Hypocrea jecorina** Berk. & Broome BGB (anam. Trichoderma reesei)	FF-TRI	2%ME	Air	26	M
311	**Hypocrea nigricans** (Imai) Doi	FF-TRI	2%ME	Air	26	M
312	**Hypocrea novaezelandiae** Samuels & O. Petrini	FF-TRI	2%ME	Air	26	M
313	**Hypocrea orientalis** Samuels & O. Petrini	FF-TRI	2%ME	Air	26	M
314	**Hypocrea pseudokoningii** Samuels & O. Petrini	FF-TRI	2%ME	Air	26	M
315	**Hypocrea schweinitzii** (Fr.) Saccardo (anam. Trichoderma citrinoviride)	FF-TRI	2%ME	Air	26	M
316	**Issatchenkia orientalis** Kudryavtsev (anam. Candida krusei)	FF-FOOD, YST	2%ME	Air	26	Mm
317	**Issatchenkia scutulata** (Phaff et al.) Kurtzman et al.	FF-YST	2%ME	Air	26	
318	**Kluyveromyces lactis var lactis** (Dombrowski) Van der Walt	FF-FOOD, YST	2%ME	Air	26	Mm
319	(anam. Candida sphaerica)					
320	**Kluyveromyces marxianus** (Hansen) Van.der Walt BGA (anam. Candida kefyr)	FF-FOOD, YST	2%ME	Air	26	Mm
321	**Kluyveromyces marxianus** (Hansen) Van.der Walt BGB (anam. Candida kefyr)	FF-FOOD, YST	2%ME	Air	26	Mm
322	**Kluyveromyces marxianus** (Hansen) Van.der Walt BGC (anam. Candida kefyr)	FF-FOOD, YST	2%ME	Air	26	Mm
323	**Kluyveromyces marxianus** (Hansen) Van.der Walt BGD (anam. Candida kefyr)	FF-FOOD, YST	2%ME	Air	26	Mm
324	**Kluyveromyces marxianus** (Hansen) Van.der Walt BGE (anam. Candida kefyr)	FF-FOOD, YST	2%ME	Air	26	Mm
325	**Lecythophora hoffmannii** (van.Beyma) W. Gams BGA	FF-FOOD	2%ME	Air	26	M
326	**Lecythophora hoffmannii** (van.Beyma) W. Gams BGB	FF-FOOD	2%ME	Air	26	M
327	**Lecythophora mutabilis** (van Beyma) W. Gams	FF-AIR	2%ME	Air	26	M
328	**Mariannaea elegans var elegans** (Corda) G. Amand ex Samson	FF-AIR	2%ME	Air	26	Mm
329	**Mariannaea elegans var punicea** Samson	FF-AIR	2%ME	Air	26	M
330	**Microdochium bolleyi** (Sprague) de Hoog & Herm.-Nijhof	FF-AIR	2%ME	Air	26	M
331	**Microsphaeropsis olivacea** (Bonorden) v. Hoehnel	FF-AIR	2%ME	Air	26	M
332	**Monascus ruber** v. Tiegham	FF-AIR, FOOD	2%ME	Air	26	M
333	**Moniliella acetoabutens** Stolk & Dakin	FF-AIR, FOOD	2%ME	Air	26	Mm
334	**Moniliella suaveolens var suaveolens** (Lindner) v.Arx	FF-AIR, FOOD	2%ME	Air	26	M
335	**Mucor circinelloides f sp circinelloides** v. Tiegham	FF-AIR, FOOD	2%ME	Air	26	Mm
336	**Mucor hiemalis f sp hiemalis** Wehmer	FF-AIR, FOOD	2%ME	Air	26	Mm
337	**Mucor mucedo** Linn.: Fr.	FF-AIR	2%ME	Air	26	M
338	**Mucor plumbeus** Bonord.	FF-AIR, FOOD	2%ME	Air	26	M
339	**Mucor racemosus f sp racemosus** Fresen.	FF-AIR, FOOD	2%ME	Air	26	M
340	**Myceliophthora lutea** Costantin	FF-AIR	2%ME	Air	26	
341	**Myrothecium roridum** Tode:Fr.	FF-AIR	2%ME	Air	26	M
342	**Myrothecium verrucaria** (Alb. & Schwein.:Fr.) Ditmar	FF-AIR	2%ME	Air	26	M
343	**Nectria aureofulva** Cooke & Ellis (anam. Clonostachys sp.)	FF-FUS	2%ME	Air	26	M
344	**Nectria hematococca** Berk. & Br. (anam. Fusarium eumartii)	FF-FUS	2%ME	Air	26	
345	**Nectria ochroleuca** (Schweinitz) Berkeley	FF-FUS	2%ME	Air	26	
346	**Nectria sesquicilli** Samuels (anam. Clonostachys sp.)	FF-FUS	2%ME	Air	26	M
347	**Neosartorya fischeri var fischeri** (Wehmer) Malloch & Cain (anam. Aspergillus .fischerianus)	FF-AIR, FOOD, ASP	2%ME	Air	26	M
348	**Neurospora crassa** Schear & Dodge	FF-AIR, FOOD	2%ME	Air	26	M
349	**Neurospora sitophilia** Schear & Dodge	FF-AIR, FOOD	2%ME	Air	26	Mm
350	**Nigrospora oryzae** (Berk. & Broome) Petch	FF-AIR, FOOD	2%ME	Air	26	Mm
351	**Nigrospora sphaerica** (sacc.) Mason	FF-AIR, FOOD	2%ME	Air	26	M
352	**Ophiostoma piceae** (Munch) H. & P. Sydow BGA	FF-AIR	2%ME	Air	26	Mm
353	**Ophiostoma piceae** (Munch) H. & P. Sydow BGB	FF-AIR	2%ME	Air	26	Mm
354	**Ophiostoma ulmi** (Buisman) Nannfeldt	FF-AIR	2%ME	Air	26	M
355	**Paecilomyces carneus** (Duché & Heim) A. Brown & G. Smith	FF-AIR	2%ME	Air	26	M
356	**Paecilomyces farinosus** (Holm:Fr.) A. Brown & G. Smith	FF-AIR	2%ME	Air	26	M
357	**Paecilomyces fumosoroseus** (Wize) A. Brown & G. Smith	FF-AIR	2%ME	Air	26	M
358	**Paecilomyces lilacinus** (Thom) Samson	FF-AIR, FOOD	2%ME	Air	26	M
359	**Paecilomyces marquandii** (Massee) S. Hughes	FF-AIR	2%ME	Air	26	M
360	**Paecilomyces variotii** (Bainer) BGA	FF-AIR, FOOD	2%ME	Air	26	Mm

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361	**Paecilomyces variotii** (Bainer) BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
362	**Penicillium adametzii** Zaleski BGA	FF-PEN	2%ME	Air	26	Mm
363	**Penicillium adametzii** Zaleski BGB	FF-PEN	2%ME	Air	26	Mm
364	**Penicillium aethiopicum** Frisvad	FF-FOOD, PEN	2%ME	Air	26	M
365	**Penicillium allii** Vincent & Pitt	FF-FOOD, PEN	2%ME	Air	26	Mm
366	**Penicillium argillaceum** Stolk et al.	FF-AIR, PEN	2%ME	Air	26	Mm
367	**Penicillium atramentosum** Thom	FF-PEN	2%ME	Air	26	M
368	**Penicillium aurantiogriseum** Dierckx BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
369	**Penicillium aurantiogriseum** Dierckx BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
370	**Penicillium aurantiovirens** Biourge	FF-PEN	2%ME	Air	26	Mm
371	**Penicillium bilaiae** Chalabuda	FF-AIR, PEN	2%ME	Air	26	Mm
372	**Penicillium brevicompactum** Dierckx BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
373	**Penicillium brevicompactum** Dierckx BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
374	**Penicillium brevicompactum** Dierckx BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
375	**Penicillium camemberti** Thom BGA	FF-FOOD, PEN	2%ME	Air	26	Mm
376	**Penicillium camemberti** Thom BGB	FF-FOOD, PEN	2%ME	Air	26	Mm
377	**Penicillium canescens** Sopp	FF-PEN	2%ME	Air	26	Mm
378	**Penicillium capsulatum** Raper & Fennell	FF-AIR, PEN	2%ME	Air	26	Mm
379	**Penicillium chermesinum** Biourge	FF-AIR, PEN	2%ME	Air	26	Mm
380	**Penicillium chrysogenum** Thom	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
381	**Penicillium citreonigrum** Dierckx BGA (teleo. Eupenicillium euglaucum)	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
382	**Penicillium citreonigrum** Dierckx BGB (teleo. Eupenicillium euglaucum)	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
383	**Penicillium citreonigrum** Dierckx BGC (teleo. Eupenicillium euglaucum)	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
384	**Penicillium citrinum** Thom	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
385	**Penicillium clavigerum** Demelius	FF-PEN	2%ME	Air	26	M
386	**Penicillium commune** Thom BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
387	**Penicillium commune** Thom BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
388	**Penicillium corylophilum** Dierckx	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
389	**Penicillium crateriforme** Gilman & Abbott	FF-PEN	2%ME	Air	26	
390	**Penicillium crustosum** Thom	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
391	**Penicillium cyclopium** Westling	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
392	**Penicillium decumbens** Thom (teleo. Eupenicillium meridianum)	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
393	**Penicillium digitatum** (Pers.:Fr.) Sacc. BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
394	**Penicillium digitatum** (Pers.:Fr.) Sacc. BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
395	**Penicillium discolor** Frisvad & Samson	FF-PEN	2%ME	Air	26	M
396	**Penicillium duclauxii** Delucr.	FF-PEN	2%ME	Air	26	M
397	**Penicillium echinulatum** Fassatiova	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
398	**Penicillium erythromellis** Hocking	FF-PEN	2%ME	Air	26	Mm
399	**Penicillium expansum** Link BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
400	**Penicillium expansum** Link BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
401	**Penicillium expansum** Link BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
402	**Penicillium expansum** Link BGD	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
403	**Penicillium fellutanum** Biourge	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
404	**Penicillium freii** Frisvad & Samson BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
405	**Penicillium freii** Frisvad & Samson BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
406	**Penicillium freii** Frisvad & Samson BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
407	**Penicillium funiculosum** Thom BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
408	**Penicillium funiculosum** Thom BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
409	**Penicillium glabrum** (Wehmer) Westling	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
410	**Penicillium glandicola var glandicola** (Oud.) Seifert & Samson	FF-PEN	2%ME	Air	26	M
411	**Penicillium griseofulvum** Dierckx	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
412	**Penicillium herquei** Bainier & Sartory	FF-AIR, PEN	2%ME	Air	26	Mm
413	**Penicillium hirsutum** Dierckx	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
414	**Penicillium hordei** Stolk	FF-AIR, FOOD, PEN	2%ME	Air	26	M
415	**Penicillium implicatum** Biourge	FF-AIR, FOOD, PEN	2%ME	Air	26	m
416	**Penicillium islandicum** Sopp	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
417	**Penicillium italicum** Wehmer	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
418	**Penicillium janczewskii** K.M. Zaleski	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
419	**Penicillium janthienellum** Biourge	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
420	**Penicillium jansenii** Zaleski	FF-PEN	2%ME	Air	26	M
421	**Penicillium lagena** (Delitsch) Stolk & Samson	FF-PEN	2%ME	Air	26	Mm
422	**Penicillium lanosum** Westling	FF-PEN	2%ME	Air	26	Mm
423	**Penicillium lividum** Westling	FF-PEN	2%ME	Air	26	M
424	**Penicillium madriti** G.Smith	FF-PEN	2%ME	Air	26	M
425	**Penicillium melanoconidium** (Frisvad) Frisvad & Samson BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
426	**Penicillium melanoconidium** (Frisvad) Frisvad & Samson BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
427	**Penicillium melinii** Thom	FF-PEN	2%ME	Air	26	Mm

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428	**Penicillium miczynski** Zaleski	FF-AIR, PEN	2%ME	Air	26	Mm
429	**Penicillium minioluteum** Dierckx BGA	FF-AIR, PEN	2%ME	Air	26	Mm
430	**Penicillium minioluteum** Dierckx BGB	FF-AIR, PEN	2%ME	Air	26	Mm
431	**Penicillium minioluteum** Dierckx BGC	FF-AIR, PEN	2%ME	Air	26	Mm
432	**Penicillium montanense** M. Christensen & Backus	FF-PEN	2%ME	Air	26	M
433	**Penicillium nalgiovense** Laxa	FF-FOOD, PEN	2%ME	Air	26	M
434	**Penicillium neoechinulatum** (Frisvad et al.) Frisvad & Samson	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
435	**Penicillium oblatum** Pitt & Hocking	FF-PEN	2%ME	Air	26	Mm
436	**Penicillium ochrochloron** Biourge BGA	FF-AIR, PEN	2%ME	Air	26	Mm
437	**Penicillium ochrochloron** Biourge BGB	FF-AIR, PEN	2%ME	Air	26	Mm
438	**Penicillium olsonii** Bainier & Sartory BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
439	**Penicillium olsonii** Bainier & Sartory BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
440	**Penicillium oxalicum** Currie & Thom	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
441	**Penicillium paxilli** Bainier	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
442	**Penicillium phoeniceum** van.Beyma	FF-AIR, PEN	2%ME	Air	26	M
443	**Penicillium piceum** Raper & Fennell	FF-AIR, PEN	2%ME	Air	26	M
444	**Penicillium pinophilum** Hedge. BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
445	**Penicillium pinophilum** Hedge. BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
446	**Penicillium pinophilum** Hedge. BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
447	**Penicillium pinophilum** Hedge. BGD	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
448	**Penicillium polonicum** Zaleski BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
449	**Penicillium polonicum** Zaleski BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
450	**Penicillium primulinum** Pitt	FF-PEN	2%ME	Air	26	Mm
451	**Penicillium purpurescens** (Sopp.) Biourge	FF-PEN	2%ME	Air	26	M
452	**Penicillium purpurogenum** Stoll BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
453	**Penicillium purpurogenum** Stoll BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
454	**Penicillium purpurogenum** Stoll BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
455	**Penicillium purpurogenum var rubisclorotium** Thom	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
456	**Penicillium raistrickii** G.Smith	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
457	**Penicillium restrictum** J.C. Gilman & E.V. Abbott BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
458	**Penicillium restrictum** J.C. Gilman & E.V. Abbott BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
459	**Penicillium roqueforti** Thom BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
460	**Penicillium roqueforti** Thom BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
461	**Penicillium roqueforti** Thom BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
462	**Penicillium roqueforti** Thom BGD	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
463	**Penicillium roqueforti** Thom BGE	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
464	**Penicillium rubrum** Stoll BGA	FF-AIR, PEN	2%ME	Air	26	M
465	**Penicillium rubrum** Stoll BGB	FF-AIR, PEN	2%ME	Air	26	M
466	**Penicillium rugulosum** Thom BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
467	**Penicillium rugulosum** Thom BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
468	**Penicillium rugulosum** Thom BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
469	**Penicillium sclerotiorum** Van.Beyma	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
470	**Penicillium siamense** Manoch & Ramirez	FF- PEN	2%ME	Air	26	Mm
471	**Penicillium simplicissimum** (Oudem.) Thom BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
472	**Penicillium simplicissimum** (Oudem.) Thom BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
473	**Penicillium smithii** Quintanilla	FF-PEN	2%ME	Air	26	M
474	**Penicillium solitum** Westling BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
475	**Penicillium solitum** Westling BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
476	**Penicillium solitum** Westling BGC	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
477	**Penicillium steckii** Zaleski BGA	FF-AIR, PEN	2%ME	Air	26	m
478	**Penicillium steckii** Zaleski BGB	FF-AIR, PEN	2%ME	Air	26	m
479	**Penicillium thomii** Maire BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
480	**Penicillium thomii** Maire BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
481	**Penicillium tricolor** Fresvad et al.	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
482	**Penicillium trubatum** Westling BGA (teleo. Eupenicillium baarnese)	FF-PEN	2%ME	Air	26	Mm
483	**Penicillium trubatum** Westling BGB (teleo. Eupenicillium baarnese)	FF-PEN	2%ME	Air	26	Mm
484	**Penicillium variabile** Sopp BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
485	**Penicillium variabile** Sopp BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
486	**Penicillium verrucosum var verrucosum** Dierckx BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
487	**Penicillium verrucosum var verrucosum** Dierckx BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
488	**Penicillium viridicatum** Westling BGA	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
489	**Penicillium viridicatum** Westling BGB	FF-AIR, FOOD, PEN	2%ME	Air	26	Mm
490	**Penicillium vulpinum** (Cooke & Massee) Seifert & Samson BGA	FF-AIR, PEN	2%ME	Air	26	Mm
491	**Penicillium vulpinum** (Cooke & Massee) Seifert & Samson BGB	FF-AIR, PEN	2%ME	Air	26	Mm
492	**Pestalotiopsis maculans** (Corda) Nag Raj	FF-AIR	2%ME	Air	26	
493	**Petromyces alliaceus** Malloch & Cain BGA (anam. Aspergillus alliaceous)	FF-AIR, FOOD, ASP	2%ME	Air	26	M
494	**Petromyces alliaceus** Malloch & Cain BGB (anam. Aspergillus alliaceous)	FF-AIR, FOOD, ASP	2%ME	Air	26	M

M *Indicates that a Macroscopic photo is present in Biolog's photo library.*
m *Indicates that a Microscopic photo is present in Biolog's photo library.*

	Species Name	Type	Medium	Atm	Temp	Photo
495	**Phanerochaete chrysosporium** Burdsall	FF-FOOD	2%ME	Air	26	M
496	**Phialophora fastigiata** (Lagerb. & Melin) Conant	FF-AIR, FOOD	2%ME	Air	26	
497	**Phialophora malorum** (Kidd & Beaumont) McColloch	FF-AIR	2%ME	Air	26	M
498	**Phialophora richardsiae** (Nannf. & Melin) Conant	FF-AIR	2%ME	Air	26	M
499	**Phoma chrysanthemicola** Hollos	FF-AIR	2%ME	Air	26	
500	**Phoma exigua var exigua** Desm.	FF-AIR	2%ME	Air	26	M
501	**Phoma glomerata** (Corda) Wollenw. & Hochapfel BGA	FF-AIR, FOOD	2%ME	Air	26	M
502	**Phoma glomerata** (Corda) Wollenw. & Hochapfel BGB	FF-AIR, FOOD	2%ME	Air	26	M
503	**Phoma herbarum** Westend.	FF-AIR	2%ME	Air	26	M
504	**Phoma macrostoma var macrostoma** Mont.	FF-AIR	2%ME	Air	26	M
505	**Phoma multirostrata** (Mathur et al.) Dorenbosch & Boerema	FF-AIR	2%ME	Air	26	
506	**Phoma septicidalis** Boerema	FF-AIR	2%ME	Air	26	M
507	**Phoma sorghina** (Sacc.) Boerema	FF-AIR, FOOD	2%ME	Air	26	M
508	**Pichia anomala** (Sydow & Sydow) Kurtzman BGA (anam. Candida pelliculosa)	FF-FOOD, YST	2%ME	Air	26	Mm
509	**Pichia anomala** (Sydow & Sydow) Kurtzman BGB (anam. Candida pelliculosa)	FF-FOOD, YST	2%ME	Air	26	Mm
510	**Pichia fermentans** Lodder BGA (anam. Candida lambica)	FF-FOOD, YST	2%ME	Air	26	M
511	**Pichia fermentans** Lodder BGB (anam. Candida lambica)	FF-FOOD, YST	2%ME	Air	26	M
512	**Pichia guilliermondii** Wickernam (anam. Candida guilliermondii)	FF-FOOD, YST	2%ME	Air	26	Mm
513	**Pichia haplophila** Shifrine & Phaff	FF-YST	2%ME	Air	26	
514	**Pichia membranifaciens** Hansen (anam. Candida valida)	FF-FOOD, YST	2%ME	Air	26	Mm
515	**Pichia pastoris** (Guilliermond) Phaff	FF-YST	2%ME	Air	26	
516	**Pichia petersonii** (Wickerham) Kurtzman	FF-YST	2%ME	Air	26	
517	**Pichia spartinae** Ahearn et al.	FF-YST	2%ME	Air	26	
518	**Pithomyces chartarum** (Berk. & Curtis) M.B. Ellis	FF-AIR	2%ME	Air	26	
519	**Pithomyces sacchari** (Speg.) M.B. Ellis	FF-AIR	2%ME	Air	26	M
520	**Rhinocladiella atrovirens** Nannf. BGA	FF-AIR	2%ME	Air	26	M
521	**Rhinocladiella atrovirens** Nannf. BGB	FF-AIR	2%ME	Air	26	M
522	**Rhizomucor pusillus** (Lindt) Schipper	FF-AIR, FOOD	2%ME	Air	26	M
523	**Rhizopus microsporus var microsporus** v. Tiegh	FF-AIR, FOOD	2%ME	Air	26	M
524	**Rhizopus oligosporus** Saito	FF-AIR, FOOD	2%ME	Air	26	Mm
525	**Rhizopus oryzae** Went & Prins. Geerl.	FF-AIR, FOOD	2%ME	Air	26	Mm
526	**Rhizopus sexualis var sexualis** (G. Sm.) Callen	FF-AIR, FOOD	2%ME	Air	26	M
527	**Rhizopus stolonifer var stolonifer** (EHRENB.:FR.) LINDNER BGA	FF-AIR, FOOD	2%ME	AIR	26	Mm
528	**Rhizopus stolonifer var stolonifer** (Ehrenb.:Fr.) Lindner BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
529	**Rhodotorula aurantica** (Saito) Lodder	FF-AIR, YST	2%ME	Air	26	Mm
530	**Rhodotorula minuta** (Saito) F.C. Harrison	FF-YST	2%ME	Air	26	
531	**Rhodotorula mucilaginosa**(AS) (A.Jörg) F.C. Harrison BGA	FF-AIR, FOOD, YST	2%ME	Air	26	M
532	**Rhodotorula mucilaginosa** (AS) (A.Jörg) F.C. Harrison BGB	FF-AIR, FOOD, YST	2%ME	Air	26	M
533	**Rhodotorula muscorum** (di Menna) von Arx & Weijman	FF-YST	2%ME	Air	26	
534	**Saccharomyces bayanas** Sacc.	FF-FOOD, YST	2%ME	Air	26	M
535	**Saccharomyces cerevisiae** Meyen ex E.C. Hanson BGA (anam. Candida robusta)	FF-FOOD, YST	2%ME	Air	26	M
536	**Saccharomyces cerevisiae** Meyen ex E.C. Hanson BGB (anam. Candida robusta)	FF-FOOD, YST	2%ME	Air	26	M
537	**Saccharomyces cerevisiae** Meyen ex E.C. Hanson BGC (anam. Candida robusta)	FF-FOOD, YST	2%ME	Air	26	M
538	**Saccharomyces cerevisiae** Meyen ex E.C. Hanson BGD (anam. Candida robusta)	FF-FOOD, YST	2%ME	Air	26	M
539	**Saccharomyces cerevisiae** Meyen ex E.C. Hanson BGE (anam. Candida robusta)	FF-FOOD, YST	2%ME	Air	26	M
540	**Saccharomyces cerevisiae** Meyen ex E.C. Hanson BGF (anam. Candida robusta)	FF-FOOD, YST	2%ME	Air	26	M
541	**Saccharomyces cerevisiae** Meyen ex E.C. Hanson BGG (anam. Candida robusta)	FF-FOOD, YST	2%ME	Air	26	M
542	**Saccharomyces exiguus**(SS) Reess ex Hanson (anam. Candida holmii)	FF-FOOD, YST	2%ME	Air	26	Mm
543	**Schizosaccharomyces octosporus** Beijerinck (Octosporomyces octosporus)	FF-FOOD, YST	2%ME	Air	26	m
544	**Schizosaccharomyces pombe** Lindler	FF-FOOD, YST	2%ME	Air	26	Mm
545	**Scopulariopsis asperula** (Sacc.) Hughes	FF-AIR	2%ME	Air	26	M
546	**Scopulariopsis brevicaulis** (Sacc.) Bainier BGA	FF-AIR, FOOD	2%ME	Air	26	Mm
547	**Scopulariopsis brevicaulis** (Sacc.) Bainier BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
548	**Scopulariopsis brumptii** Salvanet-Duval	FF-AIR	2%ME	Air	26	M
549	**Scopulariopsis candida** (Guéguen) Vuill.	FF-AIR, FOOD	2%ME	Air	26	Mm
550	**Scopulariopsis chartarum** (G. Smith) Morton & G. Smith BGA	FF-AIR	2%ME	Air	26	M
551	**Scopulariopsis chartarum** (G. Smith) Morton & G. Smith BGB	FF-AIR	2%ME	Air	26	M
552	**Scopulariopsis fusca** Zach BGA	FF-FOOD	2%ME	Air	26	Mm

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	Species Name	Type	Medium	Atm	Temp	Photo
553	**Scopulariopsis fusca** Zach BGB	FF-FOOD	2%ME	Air	26	Mm
554	**Sistotrema brinkmannii** (Bresadola) John Eriksson	FF-AIR	2%ME	Air	26	
551	**Sistotrema raduloides** (Karsten) Donk	FF-AIR	2%ME	Air	26	
552	**Sporobolomyces roseus** Kluyver & Van Niel	FF-AIR, YST	2%ME	Air	26	M
553	**Sporopachydermia ceriana** Rodrigues de Miranda	FF-YST	2%ME	Air	26	
554	**Sporothrix schenckii var schenckii** Kektoen & Perkins	FF-AIR	2%ME	Air	26	M
555	**Stachybotrys bisbyi** (Srinavesan) Barron	FF-AIR	2%ME	Air	26	
556	**Stachybotrys chartarum** (Ehrenb.) Hughes	FF-AIR, FOOD	2%ME	Air	26	M
557	**Stachybotrys cylindrospora** C.N. Jensen	FF-AIR	2%ME	Air	26	Mm
558	**Stachybotrys echinulata** (Rivolta) G. Smith	FF-AIR	2%ME	Air	26	M
559	**Sterigmatomyces elviae** Sonck & Yarrow	FF-AIR, FOOD, YST	2%ME	Air	26	
560	**Sterigmatomyces halophilus** Fell	FF-AIR, YST	2%ME	Air	26	
561	**Syncephalastrum racemosum** J.Schrot.	FF-AIR, FOOD	2%ME	Air	26	Mm
562	**Talaromyces bacillisporus** (Swift) C.R. Benjamin (anam. Penicillium bacillisporum)	FF-AIR, FOOD, PEN	2%ME	Air	26	M
563	**Talaromyces flavus var flavus** (Klocker) Stolk & Samson (anam. Penicillium vermiculatum)	FF-AIR, FOOD, PEN	2%ME	Air	26	M
564	**Talaromyces macrosporus** (Stolk & Samson) Frisvad et al. (anam. Penicillium dangesrdii)	FF-FOOD, PEN	2%ME	Air	26	Mm
565	**Thamnidium elegans** Link	FF-AIR, FOOD	2%ME	Air	26	M
566	**Tilletiopsis albescens** Gokhale	FF-AIR	2%ME	Air	26	M
567	**Torula herbarum** Link: Fr.	FF-AIR	2%ME	Air	26	M
568	**Torulaspora delbrueckii** (Lindner) Lindner (anam. Candida colliculosa)	FF-FOOD, YST	2%ME	Air	26	Mm
569	**Trichoderma asperellum**	FF-AIR, FOOD, TRI	2%ME	Air	26	M
570	**Trichoderma atroviride** Karsten	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
571	**Trichoderma aureoviride** Rifai (teleo. Hypocrea aureoviridis)	FF-TRI	2%ME	Air	26	Mm
572	**Trichoderma citrinovirde** Bissett BGA (teleo. Hypocrea schweinitzii)	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
573	**Trichoderma citrinovirde** Bissett BGB (teleo. Hypocrea schweinitzii)	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
574	**Trichoderma citrinovirde** Bissett BGC (teleo. Hypocrea schweinitzii)	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
575	**Trichoderma crassum** Bissett	FF-TRI	2%ME	Air	26	M
576	**Trichoderma fasiculatum** Bissett	FF-TRI	2%ME	Air	26	M
577	**Trichoderma fertile** Bissett	FF-TRI	2%ME	Air	26	M
578	**Trichoderma ghanense** Y. Doi, Y. Abe & J. Sugiyama	FF-TRI	2%ME	Air	26	M
579	**Trichoderma hamatum** (Bon.) Bainier	FF-AIR, TRI	2%ME	Air	26	M
580	**Trichoderma harzianum** Rifai BGA	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
581	**Trichoderma harzianum** Rifai BGB	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
582	**Trichoderma harzianum** Rifai BGC	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
583	**Trichoderma koningii** Oud. (teleo. Hypocrea koningii)	FF-AIR, TRI	2%ME	Air	26	Mm
584	**Trichoderma longibrachiatum** Rifai BGA	FF-AIR, TRI	2%ME	Air	26	Mm
585	**Trichoderma longibrachiatum** Rifai BGB	FF-AIR, TRI	2%ME	Air	26	Mm
586	**Trichoderma longibrachiatum** Rifai BGC	FF-AIR, TRI	2%ME	Air	26	Mm
587	**Trichoderma longibrachiatum** Rifai BGD	FF-AIR, TRI	2%ME	Air	26	Mm
588	**Trichoderma minutisporum** Bissett	FF-AIR, TRI	2%ME	Air	26	M
589	**Trichoderma oblongisporum** Bissett	FF-TRI	2%ME	Air	26	
590	**Trichoderma piluiliferum** Webster & Rifai (teleo. Hypocrea pilulifera)	FF-TRI	2%ME	Air	26	M
591	**Trichoderma polysporum** (Link:Fr.) Rifai	FF-AIR, TRI	2%ME	Air	26	M
592	**Trichoderma pseudokoningii** Rifai (teleo. Hypocrea pseudokoningii)	FF-TRI	2%ME	Air	26	Mm
593	**Trichoderma reesei** Simmons BGA (teleo. Hypocrea jecorina)	FF-TRI	2%ME	Air	26	Mm
594	**Trichoderma reesei** Simmons BGB (teleo. Hypocrea jecorina)	FF-TRI	2%ME	Air	26	Mm
595	**Trichoderma saturnisporum** Hammill	FF-TRI	2%ME	Air	26	Mm
596	**Trichoderma spirale** Bissett	FF-TRI	2%ME	Air	26	M
597	**Trichoderma strictipile** Bissett	FF-TRI	2%ME	Air	26	M
598	**Trichoderma strigosum** Bissett	FF-TRI	2%ME	Air	26	M
599	**Trichoderma tomentosum** Bissett	FF-TRI	2%ME	Air	26	M
600	**Trichoderma virens** (Miller et al.)v.Arx BGA	FF-TRI	2%ME	Air	26	Mm
601	**Trichoderma virens** (Miller et al.)v.Arx BGB	FF-TRI	2%ME	Air	26	Mm
602	**Trichoderma viride** Pers.:Fr.	FF-AIR, FOOD, TRI	2%ME	Air	26	Mm
603	**Trichothecium roseum** (Pers.) Link	FF-AIR, FOOD	2%ME	Air	26	Mm
604	**Trichurus spiralis** Hasselbring BGA	FF-AIR	2%ME	Air	26	M
605	**Trichurus spiralis** Hasselbring BGB	FF-AIR	2%ME	Air	26	M
606	**Tritirachium oryzae** (Vincens) de Hoog	FF-AIR	2%ME	Air	26	M
607	**Ulocladium atrum** Preuss	FF-AIR	2%ME	Air	26	M
608	**Ulocladium botrytis** Preuss BGA	FF-AIR, FOOD	2%ME	Air	26	Mm
609	**Ulocladium botrytis** Preuss BGB	FF-AIR, FOOD	2%ME	Air	26	Mm
610	**Ulocladium chartarum** (Preuss) Simmons	FF-AIR, FOOD	2%ME	Air	26	Mm
611	**Ustilago maydis** (de Candolle) Corda	FF-AIR, YST	2%ME	Air	26	Mm
612	**Verticillium lecanii** (Zimmermann) Viegas	FF-AIR	2%ME	Air	26	M

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	Species Name	Type	Medium	Atm	Temp	Photo
613	**Wallemia sebi** (Fr.) v. Arx	FF-AIR, FOOD	2%ME	Air	26	M
614	**Williopsis saturnus var saturnus** (Klocker) Zender	FF-YST	2%ME	Air	26	
615	**Yarrowia lipolytica** (SS) (Wickerham et al.) v.d. Walt & v. Arx (anam. Candida lipolytica)	FF-FOOD, YST	2%ME	Air	26	Mm
616	**Zygorhyncus moelleri** Vuillemin	FF-AIR	2%ME	Air	26	
617	**Zygosaccharomyces bailii** (Lindner) Guillierm	FF-FOOD, YST	2%ME	Air	26	Mm
618	**Zygosaccharomyces rouxii** (Boutroux) Yarrow	FF-FOOD, YST	2%ME	Air	26	Mm
619	**Zygosporium mycophilum** (Vuillemin) Saccardo	FF-AIR	2%ME	Air	26	M

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Appendix 5: Program Printouts

Manual printout (sample)

1➔ Program : Biolog MicroLog3 4.20
2➔ Read From File : C:\Biolog420\DataFiles\GNDemo2a.D4C
3➔ Edit Status : OK

4➔ Read Time : Jul 03 2001 12:07 Creator : PG
5➔ Modified Date : Jul 09 2001 07:44 Modifier: lisa
6➔ Unrestricted Access? : No
7➔ Plate Number : 5
8➔ Incubation Time : 16-24
Sample Number : 5 Plate Type: GN2
Strain Type : GN-ENT
Strain Number : 555
Strain Name : Cedecia
Other :
9➔ Data Input Mode : File
Parent File : C:\Biolog420\DataFiles\GNDemo2.D4C
10➔ Number +/b/- Reactions : 43/ 0/ 53
11➔ Database To Search : MicroLog
Data Base(s) Searched : C:\BIOLOG420\Databases\GN601.KID

Key : <X>: positive; <X-: mismatched positive; X: negative; X+: mismatched negative
{X}: borderline; -X: less than A1 well

Color	1	2	3	4	5	6	7	8	9	10	11	12
A	-	-	<+>	-	-	-	<+>	<+>		-	<+>	<+>
B	-	<+>	-	<+>	<+>	<+>	<+>	-	-	-	<+>	<+>
C	-	<+>	<+>	-	-	<+>	<+>	<+>	-	<+>	<+>	<+>
12➔ D	-	-	<+>	<+>	<+>	-	<+>	-	-	-	-	-
E	-	-	-	-	-	<+>	-	-	-		-	<+>
F	<+>	-	-	-	<+>	<+>	<+>	<+>	<+>	<+>	-	-
G	-	<+>	-	-	-	-	-	<+>	<+>	-	-	-
H	-	<+>	<+>	<+>	-	-	-	-	<+>	<+>	<+>	<+>

13➔ => Species ID: CEDECEA NETERI <=

Species	PROB	SIM	DIST	TYPE
=>1) CEDECEA NETERI	100	0.61	5.96	GN-ENT
2) CEDECEA DAVISAE	0	0.00	10.71	GN-ENT
3) KLEBSIELLA PLANTICOLA/ORNITHINOLYTICA	0	0.00	10.97	GN-ENT
4) KLEBSIELLA PLANTICOLA	0	0.00	12.94	GN-ENT
14➔ 5) ENTEROBACTER NIMIPRESSURALIS	0	0.00	13.35	GN-ENT
6) ENTEROBACTER ASBURIAE	0	0.00	13.43	GN-ENT
7) ENTEROBACTER AEROGENES (KLB. MOBILIS)	0	0.00	13.70	GN-ENT
8) ENTEROBACTER CLOACAE	0	0.00	14.04	GN-ENT
9) CITROBACTER KOSERI	0	0.00	14.38	GN-ENT
10) EWINGELLA AMERICANA	0	0.00	14.44	GN ENT
Other)				

Print Time = Jul 09 2001 07:50

Manual Printout Key

1. Software version
2. Name of file
3. Data file record Edit status: OK, Out, Hold, Atypical
4. Time MicroPlate was read
5. Time file was modified
6. Does user have Unrestricted Access to software?
7. Number of MicroPlate
8. Sample identifiers
9. Data generation mode (file)
10. Number of positive, borderline, and negative reactions
11. Name of database searched
12. Positive (<+>), borderline ({/}), and negative reactions (-). A negative (-) well with a plus (+) on the right side is a mismatch. The well read as negative, but at least 80% of the strains of that organism tested in our database were positive for that well. A plus (+) with a < on the left and a minus (–) on the right is a mismatch, but the well read as positive, while the strains in our database were mostly negative for that well.
13. Species identification/ #1 identification
14. #2-9 identifications

Reader printout (sample)

1➔ Program : Biolog MicroLog3 4.20
2➔ Read From File : C:\Biolog420\DataFiles\GNDemo1a.D4C
Edit Status : OK
3➔ Threshold Mode : Automatic: Color: 35/86
590/750 Filters Used : 6 / 5
4➔ Read Time : Feb 12 1998 08:17 Creator : AFB
5➔ Modified Date : Jul 03 2001 14:51 Modifier: lisa
6➔ Unrestricted Access? : No
7➔ Plate Number : 1
Incubation Time : 16-24
Sample Number : 1 Plate Type: GN2
Strain Type : GN-NENT OXI+
8➔ Strain Number : 3901
Strain Name : AER.SAL SS SAL
Other :
9➔ Data Input Mode : File
Parent File : C:\Biolog420\DataFiles\GNDemo1.D4C
10➔ Number +/b/- Reactions : 25 / 3 / 68
11➔ Database To Search : MicroLog
Data Base(s) Searched : C:\BIOLOG420\Databases\GN601.KID

Key : <X>: positive; <X-: mismatched positive; X: negative; X+: mismatched negative
{X}: borderline; -X: less than A1 well

Color	1	2	3	4	5	6	7	8	9	10	11	12
A	0	-9	< 286>	< 284>	< 374>	< 209>	-14	< 313>	-5	-6	-3	10
B	-11	< 347>	1	< 165>	7	< 353>	-2	-9	-3	< 325>	< 94>	5
C	11	-1	{ 60}	3	4	1	-3	5	20	-7	< 228>	3
12➔ D	0	0	4	-9	-1	3	1	-2	-1	-4	-2	-4
E	5	2	0	19	-2	0	1	-2	2	-2	-6	< 278>
F	17	< 108>	0	{ 73}	4	< 151>	< 202>	< 300>	< 228>	< 253>	21	< 101>
G	6	1	-3	11	-5	-2	10	< 261>	< 242>	-3	-5	2
H	{ 54}	< 399>	< 329>	< 214>	-3	2	9	9	< 306>	11	1	2

=> Species ID: AEROMONAS SALMONICIDA SS SALMONICIDA <=

	Species	PROB	SIM	DIST	TYPE
13➔	=>1) AEROMONAS SALMONICIDA SS SALMONICIDA	100	0.99	0.09	GN-NENT OXI+
	2) AEROMONAS ENCHELEIA	0	0.00	6.69	GN-NENT OXI+
	3) AEROMONAS HYDROPHILA-LIKE DNA GROUP 2	0	0.00	8.26	GN-NENT OXI+
	4) AEROMONAS EUCRENOPHILA DNA GROUP 6	0	0.00	8.49	GN-NENT OXI+
	5) VIBRIO FURNISSII	0	0.00	8.75	GN-NENT OXI+
14➔	6) AEROMONAS ALLOSACCHAROPHILA	0	0.00	9.07	GN-NENT OXI+
	7) VIBRIO HARVEYI	0	0.00	9.08	GN-NENT OXI+
	8) VIBRIO FLUVIALIS	0	0.00	9.80	GN-NENT OXI+
	9) AEROMONAS VERONII/SOBRIA DNA GROUP 8	0	0.00	9.83	GN-NENT OXI+
	10) VIBRIO ALGINOLYTICUS	0	0.00	9.89	GN-NENT OXI+
	Other)				

Reader and Saved File Modes Printout Key

1. Software version
2. If the printout is from a saved file, this entry lists file name, position of the entry in the file, and edit status.
3. Threshold mode. This listing may say “Manual” or “Automatic.” In Automatic mode, the software automatically calculates a threshold cutoff for negative and positive reactions, indicated by numerical OD values. Any values between these two numbers are considered borderline. The threshold can change from MicroPlate to MicroPlate, depending on the intensity of the positive reactions and the clarity of the negative reactions. In Manual Threshold mode, the user has changed the threshold cutoffs to match the visual interpretation of the plate.
4. Time MicroPlate was read
5. Time file was modified
6. Does user have Unrestricted Access to software?
7. Number of MicroPlate
8. Sample identifiers
9. Operating mode (file)
10. Number of positive, borderline, and negative reactions
11. Name of database searched
12. Numbers seen in each well is the percent change data of the OD compared to well A1 (A1 is always 0). DWD (dual wavelength data) = (590nm-750nm)x – (590nm-750nm)A1 x 1000, where x = any well. Positive (<>), borderline ({}), and negative reactions (no brackets). Numbers with no brackets and a plus (+) on the right side are mismatches. The well read as negative, but at least 80% of the strains of that organism tested in our database were positive for that well. Numbers with a < on the left and a minus (–) on the right are also mismatches, but the well read as positive, while the strains in our database were mostly negative for that well. Numbers with a minus (-) to the left of the well value mean that the well’s OD was less than the OD of the control well.
13. Species Iderntification/#1 identification
14. #2-9 identifications

Fungal printout (sample)

1➔ Program : Biolog MicroLog3 4.20
2➔ Read From File : C:\Biolog420\DataFiles\FFID2.D4C
Save To File : ....
3➔ Threshold Mode : Automatic: Color: 47/145; Turbidity: 53/147
4➔ 490/750 Filters Used : 3 / 5
5➔ Read Time : Jun 01 3898 13:03 Creator : AFB
6➔ Modified Date : --- Modifier:
7➔ Unrestricted Access? : No
8➔ Plate Number : 1
Incubation Time : 72 HR
Sample Number : 1 Plate Type: FF
Strain Type : Aspergillus
Strain Number : FBF 137
9➔ Strain Name : ASP.WEN
Other :
10➔ Data Input Mode : File
Parent File : C:\Biolog420\DataFiles\Ffid.D4C
11➔ Number +/b/- Reactions : 93 / 26 / 73; Color: 47 / 10 / 39; Turbidity: 46 / 16 / 34
Database To Search : MicroLog
12➔ Data Base(s) Searched : deprecated database format

Key : <X>: positive; <X-: mismatched positive; X: negative; X+: mismatched negative
{X}: borderline; -X: less than A1 well

Color	1	2	3	4	5	6	7	8	9	10	11	12
A	0	< 270>	-13	<1292>	-7	< 187>	< 169>	-6	< 460>	< 164>	{ 143}	< 310>
B	-15	-25	< 353>	< 372>	< 870>	-38	33	<1333>	< 465>	<1119>	-12	< 749>
C	{ 64}	-40	2	< 991>	{ 59}	< 487>	<1125>	-7	-13	7	< 543>	17
D	< 684>	< 796>	< 299>	46	3	8	0	< 764>	< 209>	{ 57}	< 232>	< 253>
E	32	< 199>	-8	< 753>	< 181>	{ 107}	< 625>	-16	< 179>	< 315>	42	< 557>
F	< 705>	-25	< 849>	-37	-7	< 733>	{ 52}	-52	-12	21	<1487>	<1232>
G	<1571>	{ 68}	< 277>	< 166>	{ 112}	-4	9	<1610>	< 573>	<1753>	< 267>	<1090>
H	{ 83}	19	31	<1100>	<1501>	{ 77}	40	2	32	-13	-2	-14

13➔ Turbidity

A	0	< 421>	0	< 322>	6	< 259>	{ 136}	34	< 478>	< 192>	< 254>	< 413>
B	< 189>	< 197>	< 458>	< 210>	<1040>	-11	{ 107}	< 282>	< 506>	< 674>	19	< 997>
C	{ 61}	26	24	< 307>	{ 75}	< 195>	< 218>	34	29	38	< 550>	32
D	< 346>	< 669>	< 981>	{ 78}	29	2	48	< 611>	< 230>	{ 118}	< 429>	< 325>
E	27	{ 82}	11	<1102>	< 160>	< 162>	<2475>	13	< 192>	< 218>	{ 75}	< 653>
F	< 278>	{ 62}	< 174>	13	34	< 163>	35	14	32	34	< 189>	< 725>
G	< 229>	< 224>	{ 134}	{ 86}	< 370>	19	3	< 206>	{ 118}	< 240>	{ 75}	{ 123}
H	42	-2	{ 94}	< 989>	< 181>	8	13	5	29	{ 59}	-10	8

14➔ => Species ID: Aspergillus wentii Wehmer <=

Species	PROB	SIM	DIST	TYPE
=>1) Aspergillus wentii Wehmer	100	0.70	4.50	ASP
2) Aspergillus sepultus Tuthill & Christensen	0	0.00	8.69	ASP
3) Emericella quadrilineata (Thom & Raper) C.R. Benjamin	0	0.00	9.60	ASP
4) Aspergillus carbonarius (Bainier) Thom	0	0.00	10.29	ASP
15➔ 5) Aspergillus carneus (v. Tiegham) Blockwitz	0	0.00	11.31	ASP
6) Aspergillus niger v. Tiegham BGB	0	0.00	11.88	ASP
7) Emericella violacea (Fennell & Raper) Malloch & Cain	0	0.00	11.96	ASP
8) Aspergillus phoenicis (Corda) Thom	0	0.00	12.02	ASP
9) Aspergillus ostianus Wehmer	0	0.00	13.19	ASP
10) Aspergillus sparsus Raper & Thom	0	0.00	13.23	ASP
Other)				

Print Time = Jul 09 2001 08:00

FF Printout Key

1. Software version
2. If the printout is from a saved file, this entry lists file name, position of the entry in the file, and edit status.
3. Threshold mode. This listing may say "Manual" or "Automatic." In Automatic mode, the software automatically calculates a threshold cutoff for negative and positive reactions, indicated by numerical OD values. Any values between these two numbers are considered borderline. The threshold can change from MicroPlate to MicroPlate, depending on the intensity of the positive reactions and the clarity of the negative reactions. Two thresholds are given for the FF MicroPlate: color (for 490 nm readings) and turbidity (for 750 nm readings).
4. Filters and their positions
5. Time MicroPlate was read
6. Time file was modified
7. Does user have Unrestricted Access to software?
8. Number of MicroPlate
9. Sample identifiers
10. Operating mode (file)
11. Number of positive, borderline, and negative reactions and listed for color and turbidity
12. Name of database searched
13. OD data for each well (in 8x12 format)
    - For color data: The numbers seen in each well is the percent change data of the optical density of the difference between 490nm and 750 nm compared to the A1 control well (A1 will always be 0). The Dual Wavelength Data formula =. DWD = (490nm - 750nm)x - $(490nm - 750nm)_{A1}$ x 1000, where x = any well. The turbidity is subtracted out to obtain the OD contributed by the color
    - For the Turbidity Data: The numbers seen in each well is the percent change data of the optical density of the 750 nm readings compared to the A1 control well (A1 will always be 0). The % Change formula = % Change 750nm = (750nmx - 750nmA1) x 1600, where x = any well*
    - Positive (<>), borderline ({}), and negative reactions (no brackets). Numbers with no brackets and a plus (+) on the right side are mismatches. The well read as negative, but at least 80% of the strains of that organism tested in our database were positive for that well. Numbers with a < on the left and a minus (–) on the right are also mismatches, but the well read as positive, while the strains in our database were mostly negative for that well. Numbers with a minus (-) to the left of the well value mean that the well's OD was less than the OD of the control well.
14. Species Identification/#1 identification
15. #2-9 identifications

*We use a larger multiplication factor for the turbidity to have the OD readings on the same scale as 490 readings.

Print ranked data headers printout (sample)

Print Ranked Data Headers

DATA HEADERS

Current Date = 7/9/01 10:13:27 AM
Program = C:\BIOLOG420\ML3_420.EXE
Data File = C:\Biolog420\DataFiles\GNGPden.D4C
Index File = C:\Biolog420\DataFiles\GNGPden.ISC
Sort File = C:\Biolog420\DataFiles\GNGPden.SSC
Organism Type = 5 : GP-COCCUS
Day Index = 0

2/ 2) Enterococcus

(F #)	OK	MK	Created	Plate	Sample	Hr	Plate	Strain Type	Strain Name	Strain #	Other	ID Result
(4)	OK		Jan 19 2001	?	7	24 HR	GP2	GP-COCCUS	Enterococcus	777		Species ID
(5)	OK		Jan 19 2001	?	8	24 HR	GP2	GP-COCCUS	Enterococcus	888		Species ID
(6)	OK		Jan 19 2001	?	9	24 HR	GP2	GP-COCCUS	Enterococcus	999		Species ID

DATA HEADERS

Current Date = 7/9/01 10:13:27 AM
Program = C:\BIOLOG420\ML3_420.EXE
Data File = C:\Biolog420\DataFiles\GNGPden.D4C
Index File = C:\Biolog420\DataFiles\GNGPden.ISC
Sort File = C:\Biolog420\DataFiles\GNGPden.SSC
Organism Type = 1 : GN-ENT
Day Index = 0

1/ 2) Cedecia

(F #)	OK	MK	Created	Plate	Sample	Hr	Plate	Strain Type	Strain Name	Strain #	Other	ID Result
(1)	OK		Jan 19 2001	?	4	24 HR	GN2	GN-ENT	Cedecia	444		Species ID
(2)	OK		Jan 19 2001	?	5	24 HR	GN2	GN-ENT	Cedecia	555		Species ID
(3)	OK		Jan 19 2001	?	6	24 HR	GN2	GN-ENT	Cedecia	666		Species ID

Print species counts (sample)

Print Species Counts

SPECIES COUNT

Current Date = 7/9/01 10:13:27 AM
Program = C:\BIOLOG420\ML3_420.EXE
Data File = C:\Biolog420\DataFiles\GNGPden.D4C
Index File = C:\Biolog420\DataFiles\GNGPden.ISC
Sort File = C:\Biolog420\DataFiles\GNGPden.SSC
Organism Type = 1 : GN-ENT

1/ 2) Cedecia #Plates = 3 #STR = 3

total plates = 3
total strains = 3
total species = 1

SPECIES COUNT

Current Date = 7/9/01 10:13:27 AM
Program = C:\BIOLOG420\ML3_420.EXE
Data File = C:\Biolog420\DataFiles\GNGPden.D4C
Index File = C:\Biolog420\DataFiles\GNGPden.ISC
Sort File = C:\Biolog420\DataFiles\GNGPden.SSC
Organism Type = 5 : GP-COCCUS

2/ 2) Enterococcus #Plates = 3 #STR = 3

total plates = 3
total strains = 3
total species = 1

Print species/plate dendrograms, page 1 (sample)

Print Species / Plate Dendrograms

SPECIES / PLATE DENDROGRAM

Current Date = 7/9/01 10:09:49 AM
Program = C:\BIOLOG420\ML3_420.EXE
Data File = C:\Biolog420\DataFiles\GNGPden.D4C
Out File = C:\BIOLOG420\tree2.drn
Ref Dist = 10
Comment = #5 = GP-COCCUS: Species / Plate = Enterococcus

```
|.........|.........|.........|.........|.........|
                                          /---( 0)  A 1  ( 3)  Enterococcus SA:7 ST:777
                                /---------+---( 1)  A 2  ( 4)  Enterococcus SA:8 ST:888
 --------  ----------------+
                          \---------------( 2)  B 3  ( 5)  Enterococcus SA:9 ST:999
|.....|...|.....|.....|.....|.....|.....|
```

TOTAL DATA = 3 # Entries = 3

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	17	67	0	0	0	0	0	100	100	0
B	0	0	100	100	67	0	67	0	67	0	100	0
C	67	0	67	67	67	100	0	0	0	0	0	0
D	67	0	0	100	0	0	100	100	0	0	0	100
E	0	100	0	0	0	0	67	67	0	0	0	0
F	0	0	33	0	0	67	0	0	0	0	0	0
G	0	0	0	33	0	0	0	0	0	0	0	67
H	100	67	33	67	100	0	0	0	0	0	0	0

avg % = 93.575 # pos = 13

TREE GROUP A : # Entries = 2

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	25	100	0	0	0	0	0	100	100	0
B	0	0	100	100	50	0	100	0	100	0	100	0
C	100	0	100	100	100	100	0	0	0	0	0	0
D	100	0	0	100	0	0	100	100	0	0	0	100
E	0	100	0	0	0	0	100	100	0	0	0	0
F	0	0	50	0	0	100	0	0	0	0	0	0
G	0	0	0	50	0	0	0	0	0	0	0	100
H	100	100	50	100	100	0	0	0	0	0	0	0

avg % = 37.656 # pos = 27

TREE GROUP B : # Entries = 1

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	0	0	0	0	0	0	0	100	100	0
B	0	0	100	100	100	0	0	0	0	0	100	0
C	0	0	0	0	0	100	0	0	0	0	0	0
D	0	0	0	100	0	0	100	100	0	0	0	100
E	0	100	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0
H	100	0	0	0	100	0	0	0	0	0	0	0

avg % = 100.000 # pos = 14

Print species/plate dendrograms, page 2 (sample)

Print Species / Plate Dendrograms

SPECIES / PLATE DENDROGRAM:

Current Date	= 7/10/01 9:41:08 AM
Program	= C:\BIOLOG420\ML3_420.EXE
Data File	= C:\Biolog420\DataFiles\GNGPden.D4C
Out File	= C:\BIOLOG420\tree2.prn
Ref Dist	= 10
Comment	= #1 = GN-ENT: Species / Plate = Cedecia

```
|....:....|....:....|....:....|....:....|
                                /-----( 0)  A 1  ( 0)  Cedecia SA:4 ST:444
 -------------------------------+---+( 1)  A 2  ( 1)  Cedecia SA:5 ST:555
                                \-( 2)  A 3  ( 2)  Cedecia SA:6 ST:666
|....:....|....:....|....:....|....:....|
```

TOTAL DATA = : # Entries = 3

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	33	100	0	0	0	100	100	0	0	100	100
B	0	100	0	100	100	100	100	0	0	0	100	100
C	0	100	100	0	0	100	100	100	0	100	100	100
D	0	0	100	100	100	0	100	33	0	0	0	0
E	0	0	0	0	0	100	0	0	0	0	0	100
F	100	33	33	0	100	100	100	100	100	100	0	0
G	0	67	0	0	0	0	0	100	100	67	0	0
H	0	100	100	100	0	0	0	0	100	100	100	67

avg % = 97.569 # pos = 41

TREE GROUP A : # Entries = 3

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	33	100	0	0	0	100	100	0	0	100	100
B	0	100	0	100	100	100	100	0	0	0	100	100
C	0	100	100	0	0	100	100	100	0	100	100	100
D	0	0	100	100	100	0	100	33	0	0	0	0
E	0	0	0	0	0	100	0	0	0	0	0	100
F	100	33	33	0	100	100	100	100	100	100	0	0
G	0	67	0	0	0	0	0	100	100	67	0	0
H	0	100	100	100	0	0	0	0	100	100	100	67

avg % = 97.569 # pos = 41

Print species/plate dendrograms, page 3 (sample)

SPECIES / PLATE DENDROGRAM

Current Date = 7/10/01 9:49:44 AM
Program = C:\BIOLOG420\ML3 420.EXE
Data File = C:\Biolog420\DataFiles\GNGPden.D4C
Out File = C:\BIOLOG420\tree2.prn
Ref Dist = 10
Comment = #1 = GN-ENT: Species / Plate = Cedecia

```
|....:....|....:....|....:....|....:....|
                                /-----( 0)  A 1  ( 0)  Cedecia SA:4 ST:444
 ------------------------------+---+-( 1)  A 2  ( 1)  Cedecia SA:5 ST:555
                                \-( 2)  A 3  ( 2)  Cedecia SA:6 ST:666
|....:....|....:....|....:....|....:....|
```

TOTAL DATA = : # Entries = 3

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	33	100	0	0	0	100	100	0	0	100	100
B	0	100	0	100	100	100	100	0	0	0	100	100
C	0	100	100	0	0	100	100	100	0	100	100	100
D	0	0	100	100	100	0	100	33	0	0	0	0
E	0	0	0	0	0	100	0	0	0	0	0	100
F	100	33	33	0	100	100	100	100	100	100	0	0
G	0	67	0	0	0	0	0	100	100	67	0	0
H	0	100	100	100	0	0	0	0	100	100	100	67

avg % = 97.569 # pos = 41

TREE GROUP A : # Entries = 3

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	33	100	0	0	0	100	100	0	0	100	100
B	0	100	0	100	100	100	100	0	0	0	100	100
C	0	100	100	0	0	100	100	100	0	100	100	100
D	0	0	100	100	100	0	100	33	0	0	0	0
E	0	0	0	0	0	100	0	0	0	0	0	100
F	100	33	33	0	100	100	100	100	100	100	0	0
G	0	67	0	0	0	0	0	100	100	67	0	0
H	0	100	100	100	0	0	0	0	100	100	100	67

avg % = 97.569 # pos = 41

Print species/plate dendrograms, page 4 (sample)

SPECIES / PLATE DENDROGRAM

Current Date = 7/10/01 9:41:09 AM
Program = C:\BIOLOG420\ML3_420.EXE
Data File = C:\Biolog420\DataFiles\GNGPden.D4C
Out File = C:\BIOLOG420\tree2.prn
Ref Dist = 10
Comment = #5 = GP-COCCUS: Species / Plate = Enterococcus

```
|....:....|....:....|....:....|....:....|
                                  /---( 0)  A 1  ( 3)  Enterococcus SA:7 ST:777
                            /-----------+---( 1)  A 2  ( 4)  Enterococcus SA:8 ST:888
                            |           |
                            |           \---------------( 2)  B 3  ( 5)  Enterococcus SA:9 ST:999
|....:....|....:....|....:....|....:....|
```

TOTAL DATA = : # Entries = 3

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	17	67	0	0	0	0	0	100	100	0
B	0	0	100	100	67	0	67	0	67	0	100	0
C	67	0	67	67	67	100	0	0	0	0	0	0
D	67	0	0	100	0	0	100	100	0	0	0	100
E	0	100	0	0	0	0	67	67	0	0	0	0
F	0	0	33	0	0	67	0	0	0	0	0	0
G	0	0	0	33	0	0	0	0	0	0	0	67
H	100	67	33	67	100	0	0	0	0	0	0	0

avg % = 93.576 # pos = 13

TREE GROUP A : # Entries = 2

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	25	100	0	0	0	0	0	100	100	0
B	0	0	100	100	50	0	100	0	100	0	100	0
C	100	0	100	100	100	100	0	0	0	0	0	0
D	100	0	0	100	0	0	100	100	0	0	0	100
E	0	100	0	0	0	0	100	100	0	0	0	0
F	0	0	50	0	0	100	0	0	0	0	0	0
G	0	0	0	50	0	0	0	0	0	0	0	100
H	100	100	50	100	100	0	0	0	0	0	0	0

avg % = 97.656 # pos = 27

TREE GROUP B : # Entries = 1

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	0	0	0	0	0	0	0	100	100	0
B	0	0	100	100	100	0	0	0	0	0	100	0
C	0	0	0	0	0	100	0	0	0	0	0	0
D	0	0	0	100	0	0	100	100	0	0	0	100
E	0	100	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0
H	100	0	0	0	100	0	0	0	0	0	0	0

avg % = [illegible] # pos = 14

Appendix 6: Dangerous Pathogen (DP) Database

Biolog makes a supplemental database for species falling into a category called Dangerous Pathogens (e.g., the organisms that generally require BL2-BL3 handling protocols). If your laboratory is testing for these pathogens, you will know in advance if any samples are suspected of containing these organisms. Follow the instructions in the body of this user guide. As appropriate, also follow the special procedures listed here.

Safety Considerations

To comply with government safety regulations[1] use Biosafety Level 2 (BL2) methods, containment equipment, and facilities. Immunization of laboratory personnel may be required. It is recommended that Biosafety Level 3 (BL3) practices, containment equipment, and facilities are used for work involving production volumes or concentration of cultures, and for activities that have a high potential for aerosol production. In these facilities, immunization is recommended for all persons working with the agent, all persons working in the same laboratory room where the cultures are handled, and all persons working with infected animals.

Special Procedures for Dangerous Pathogens

For the most part, you will prepare, read, and interpret these samples exactly as described throughout this manual. There are, however, a few exceptions. Table 13-1 lists the special procedures required for dangerous pathogens.

[1] Biosafety in Microbiological and Biomedical Laboratories, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and National Institutes of Health, Fourth Edition, May 1999.

Organism	Special Procedures
Francisella tularensis	Set up as a Gram-negative Fastidious organism Do not add thioglycolate to inoculating fluid
Yersinia pestis	Set up as an Gram-negative Enteric organism Do not add thioglycolate to inoculating fluid Grow only on BUG + Blood (not TSA + Blood)
Burkholderia mallei and *Burkholderia pseudomallei*	Set up as a Gram-negative Non-Enteric organism Grow only on BUG + Blood (not TSA + Blood) Incubate at 30° C
Brucella mellitensis (Use this procedure for *B. abortus*, *B. canis*, *B. suis* and other species that have been reclassified as *B. mellitensis*.)	Set up as a Gram-negative Fastidious organism Do not add thioglycolate to inoculating fluid Multiple chocolate plates are needed to obtain proper inoculum

TABLE 12-1: PROCEDURE EXCEPTIONS FOR DANGEROUS PATHOGENS